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SUPREME COURT OF THE UNITED STATES

OCTOBER TERM, 1928

POWERS-KENNEDY CONTRACTING CORPORATION and ANTHONY G. FLECK
Defendants-Petitioners

v.

CONCRETE MIXING & CONVEYING COMPANY
Plaintiff-Respondent

No. 501

3

BRIEF FOR PLAINTIFF-RESPONDENT

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Supreme Court of the United States

OCTOBER TERM, 1928.

POWERS-KENNEDY CONTRACTING CORPORATION and ANTHONY G. FLECK, *Petitioners,* *against* CONCRETE MIXING AND CONVEYING COMPANY, *Respondent.*	No. 501.

BRIEF FOR RESPONDENT.

CORRECTED STATEMENT OF THE CASE.

There are so many errors, inaccuracies and omissions in the "Statement of the Case" in petitioners' brief that the following corrected statement is deemed necessary. The numerals correspond generally with those of petitioners' statement.

1. The original decision of the Court of Appeals for the Second Circuit sustaining the McMichael patent in suit No. 1,127,660 is found in the case of *Concrete Mixing & Conveying Company* v. *Ulen Contracting Corporation, et al.*, reported in 12 Fed. (2), 929, 931. The record in that case is Exhibit D in the present suit, and the opinion of the lower court (A. N. HAND, J.), is also found at pages 395 to 402 of that Exhibit record. The Court of Appeals (ROGERS, HOUGH and MACK, JJ.) affirmed in that case without opinion. Reference to this decision is omitted from petitioners' list of "Opinions of Lower Courts."

2. The McMichael patent is not for **blowing** concrete, but for transporting and placing it by pneumatic **pressure.** It is for an air *pressure* method and apparatus for conveying and placing concrete *in a mass*, as distinguished from blowing or flotation, such as was previously employed in the conveyance of light or finely divisible materials, such as grain, dust and sand. *Neither the word blowing nor any equivalent expression is found in the patent.* Nor is such a term used in the practical art.

The words "blowing" and "blow" so frequently used in petitioners' brief are therefore misleading, and were evidently invented by the petitioners to confuse the pneumatic pressure apparatus of the patent with prior irrelevant patents for devices for the blowing or flotation of such materials as could be blown or floated in air, and which devices could not be employed and were worthless for the purpose of transporting concrete.

The air jet at the outlet of the chamber 1 of the patent in suit *is not within the chamber,* but "at or near to the discharge or lower end of the hopper 2" (Pat. R. 284, line 62), so as to discharge a jet of air *in the outlet,* as the patent very fully describes and claims, and as the drawing shows. The requisites of this outlet air jet as to character, location and action are fully specified in the patent *and leave no possible room for misunderstanding.* It must be so located and arranged as to discharge a jet of air into the materials as they pass through the contracted outlet of the vessel. Its location is not limited, but is expressly *unlimited,* to the exact location illustrated, so long as it is so located as to discharge its jet of air into the materials *as they pass through the contracted outlet.* It is shown in the patent as located in the vessel only in the sense that it is in the *outlet* thereof and so directed as to discharge its jet into this outlet in the direction of the delivery pipe, and into that pipe.

All apparatus made under the patent, and the petitioners' apparatus as well, *are a full embodiment of this feature*, the location being varied slightly only to adapt the bottom jet to the performance of its peculiar functions in different sizes and forms of apparatus (see drawings, *infra*, and R. 292-294, also Exhibit D, pp. 188 and 194-5).

3. **The McMichael patent is for a pioneer invention.** No apparatus or method for pneumatically conveying concrete or any similar material, was known prior thereto, although concrete had been conveyed in various other ways from time immemorial. The Court of Appeals so held in this case.

4. The only apparatus which even purported to convey concrete pneumatically was that of the Smith *paper* patent of 1872, which pretended to convey "liquid" concrete by merely putting air pressure behind it, *and lacked the most vital and essential feature of the McMichael apparatus, viz.: the compressed air jet at the outlet.* The absence of this feature rendered it *useless.* No attempt has been made to show that it was ever used or could be practically used for concrete. But even if it could it would have no bearing on the McMichael patent because it lacked *the essential feature* specified in the latter and included in all the claims.

5. **Nor was this jet or the method made possible by it disclosed in any other patent.** The *Beach* patent No. 267,318 (R. 305) shows merely a pipe, G, into which light, loose material—"grain, etc."—is fed through a small pipe F and there taken up by a current of air and *floated* along "*in suspension*" (R. 307, lines 2-21, 36-45). There is no jet or nozzle at all. (All italics in quotations ours unless otherwise noted.)

The *Farnham* patent No. 747,396, shows a "*sand blast* apparatus" in which the sand passes from a tank, 1,

through a relatively long narrow pipe, 2, to an "air-blast pipe 7," with a nozzle, 11, "projected across the mouth of the discharge-pipe 2" so that it "creates a *suction* across the discharge-pipe and down through the same, so that the downflow of the sand through the pipe is greatly facilitated" (Pat. p. 1, line 79, etc.). This is not the McMichael jet projecting compressed air *into the outlet to force* the material under *high pressure* through the contracted outlet and into the delivery pipe, but is a *suction* nozzle creating a feeble suction to draw loose, finely divided materials through the outlet and then float it on the blast of air. It could not be used with heavy, rocky, plastic concrete or any similar material, and gives no suggestion of the form, location and purpose of McMichael's pressure concrete-shooting jet.

The *Warren* patent No. 671,303 is also for a *"sand blast"* device, and like the Beach patent has the sand passed through a small discharge pipe, D, and discharged into an enlarged cylindrical air *"chamber,"* E, into a blast of air passing through said chamber, "with which it mingles and by which it carried" (Pat. lines 68-9). This does not even show a jet or nozzle of any kind.

The *Goldie* patent No. 707,840 permits the material (dry cement and sand) to flow by gravity from a "funnel 16" through a small pipe, without pressure behind it, and in a loose state, and then in the course of the pipe subjects it to "a suitable source of fluid-pressure such as the steam pipe 17" (Pat. p. 2, line 108, etc.), so that it mingles therewith and with water from a pipe 20 and passes along to a point beneath railroad ties. The patent is for "ballasting railway tracks" and the crude device does not pretend to work like McMichael's, if indeed it would work for any useful purpose even with the fine, dry materials mentioned.

In all four patents the pressure jet impinging on the packed heavy mass of materials as they pass through

the outlet of the vessel, under heavy pressure, to shoot them—*after the manner of a blow gun*—is lacking. The McMichael method or apparatus *is not even suggested*, and the apparatus of each patent is so constructed as to float the materials along in a state of suspension mixed with air and the operation *is absolutely impossible with such material as concrete.*

These prior patents are all for *flotation or "kinetic"* apparatus, whereas the McMichael patent is for a *pressure* apparatus and method in which the materials are propelled en masse and without separation or disintegration. *The difference is radical.*

6. **The McMichael patent is not for handling "granular plastic and fluent materials," but for "transporting and treating concrete," and concrete only.** This is called "concrete," or "concrete forming materials" which means the same thing, in the specifications and claims. The material is fully specified in the patent as "a composition containing relatively large pieces of rock or stone, as uniform in size as possible, together with predetermined proportions of sand, cement and water," the purpose of which is to produce when placed and set "a hard rock-like body"(Pat. p. 2, lines 100, etc.). In other words it is *concrete in a plastic or unset state.* The fact that McMichael when he filed his application expected to use his apparatus for conveying other building material such as sand and plaster *in addition to concrete* has nothing to do with the patent as issued, which is expressly and specifically limited to *concrete.* Probably the apparatus and method described will convey other things in a more or less wet, plastic state, so that they can be *packed* and shot by pressure like a projectile in a blow gun, but nowhere in the patent or the proceedings leading up to it is any claim made that they will act on these materials except by *pressure*—and not by flotation or kinetic action—

as they can only and must act on concrete. In the patent, and at every stage of the proceedings, from the beginning (see amdt. Jan. 18, 1908, Ulen R. Exhibit D, 206) the distinction between the apparatus of McMichael and "current of air carrying" and liquid forcing apparatus is emphasized, and this distinction is made clear and unmistakable in the patent (p. 2, lines 73, etc., p. 4, lines 29, etc.). Thus it is made clear and emphasized that the vital feature of the invention is *a combined static and velocity high pressure which first presses the mass of plastic materials into a restricted neck and there subjects it to a velocity jet which penetrates the mass and drives it into and through the conveying conduit to the point of delivery* (p. 2, lines 25-73 and 80-92).

The persistent and oft repeated use of the words "blow" and "blowing" and the equally persistent reference to "granular plastic and fluent" materials in petitioners' brief is an obvious attempt to create a misunderstanding of the invention.

The narrow contracted neck of the vessel and its outlet are *part of the receptacle* or retort in which the materials are operated on by the combined static and velocity pressure. It is the same in the patent and respondent's apparatus as in petitioners' apparatus. *The vital thing is that the materials are pressed into the contracted outlet and in this outlet penetrated and driven forward by the velocity jet.*

7. **The prior patents do not show that blowing or pneumatic conveyance of any materials, except very light or very finely divisible materials, was practiced.** Much less was pneumatic conveyance of plastic concrete, a mass of broken rock filled with wet sand and mortar, practiced. The only patentee who *dreamed* of such a thing was Smith in 1872, who never *practiced* it and never

could have practiced it, with his apparatus, because he got no farther than to put air pressure behind his material only, *and without any nozzle action,* thinking that he could force it through a pipe in this manner a short distance from a mixer to a roadway. Even he realized that he could have no hope of doing this unless he used *liquid* "concrete." He therefore proposed to use *"three-fifths"* of water, making a "fluid" *"capable of flowing freely through pipes,"* like water (Smith Pat. 122,497, p. 1, par. 3). In other words he proposed *to float his concrete aggregates in water* (water has 800 times the density of air), and incidentally to *destroy* their value as building material, which alone explains why in the forty-five years between the Smith patent and the McMichael patent Smith's method and apparatus *were never heard of.*

The fact that petitioners have *called* their concrete "liquid" means nothing. It is *not* liquid. The engineers of the Transit Commission would no more have permitted them to use liquid concrete than ordinary clay in the subway lined by them with thousands of human lives to be protected by it daily. Concrete must be, when set, as hard as the rock which is lined by it, or harder. What the petitioners did use was "plastic" concrete which needed to be rammed, as their specifications required (Exhibit 19) and in which the inspectors, according to Mr. Kennedy, their superintending officer, permitted them to use "a little more water" (XQ149, R. 220).

The blowing of light or finely divided materials described in the prior patents is something radically different from the pressure shooting of concrete of McMichael's method and the petitioners'. In the former the light or fine materials are actually *floated* in a large volume of air, like leaves, dust or sand in a gale—while in the latter plastic concrete, which is as heavy as rock—two tons per cubic yard—and is in fact "rock in the making," is *forced,* without separation, by high air *pressure* through a pipe,

which it fills substantially, at a rate of a mile a minute, any desired distance and to any desired elevation, around numerous sharp bends in the pipe if necessary, to the point of placement where it is driven home or packed by its tremendous momentum. That it is delivered *solid* is conceded; and this alone proves that it is not floated en route in air.

8. Thus we see that the petitioners are not using anything taught by prior patents, but are using the method and apparatus of the McMichael patent in suit in its entirety.

9. **The form of apparatus used by the respondent in its commercial apparatus is that of the McMichael patent as shown, described and claimed.** The *exact* location of the all-essential jet at the outlet is immaterial. The patent teaches that this jet or "velocity nozzle" is to be located near where the contracted outlet joins the discharge duct or delivery conduit and arranged to direct the compressed air jet *"into the discharge duct,"* as the claims have it (see Claims 17, 21, 28, etc.) the discharge duct being "left substantially unobstructed." The patent makes it clear that the outlet of the vessel, where it merges with the discharge duct must be gradually contracted but open to the static pressure behind the packed mass in the vessel and free of obstruction and that the velocity nozzle *must be located there and directed into the duct.* The exact form and proportions are not important so long as this formula is followed; and this formula is followed in all respondent's commercial apparatus, as it must be. The petitioners' apparatus—as usual—is *an imitation of respondent's commercial apparatus* (see Ulen R., Exhibit p. 183, &c. and Exhibits 3, 4, 5, R. 292-4) *and embodies the requirements of the patent, and its claims, in every particular.*

10. **The patent is not for the slug theory, or any other theory, but for a method and apparatus for transporting concrete, in which a combination of pressure behind a mass of concrete and a jet of pressure injected into it at a contracted discharge outlet is employed in a certain way.** It is believed that this results in the rapid detachment of slugs or "sub-masses," which are driven or "shot" through the discharge conduit by the pressure to the point of delivery, and that in this manner only can the transportation and delivery of the heavy, rocky concrete by air pressure, in a mass, without disturbing the intimate mixture of the aggregates, be accounted for. *Whether this is correct or not, however, is a matter of no importance.* It is certain that the astonishing result of conveying and delivering tons of carefully mixed concrete *intact* by a small jet of compressed air, at a pressure easily produced and maintained, is accomplished by the patented invention, and that the respondent has used that invention in all its essentials, and this is sufficient.

Nothing was added to the original disclosure of the McMichael application which was not based on his original drawing and description. Not a line of his original drawing was changed. This drawing in the patent is *identical* with the original drawing as filed, and the original description and claims set forth the apparatus and its operation with sufficient fullness to enable a "person skilled in the art" to understand, make and use them. Any such person following the original application could have made and used an apparatus embodying the invention. McMichael, however, may not have understood fully, the wonderful range of usefulness of his invention nor the full nature of his discovery. And in elaborating his description and claiming his invention in such a way as to cover and protect it properly he did only what he had full right to do. This required no new oath,

since it was within his original disclosure and departed from it in no way. *McMichael, however, did file a new oath,* covering everything in his patent as granted (File Wrapper, Ulen R., Exhibit D, 251), and this disposes of the question.

11. **That petitioners' apparatus uses all the features of the patent, including compressed air above the concrete in the chamber, or "behind the mass" is not seriously disputed in the evidence.** The only matters on which any question is raised are the position of the jet at the outlet and the pressure behind the mass. As to the first, it is not contended that the function or result is not the same nor that the characteristics of the jet at the outlet as described and claimed in the patent are not present. The matter is purely an argument of counsel with no basis in evidence or fact. The slight variations—now stressed for the first time—are of form and not of substance. As to the second, even petitioners' expert admits that pressure in the upper part of the chamber and behind the mass is established as soon as air is turned on at the outlet, and is maintained at all times during operation, as shown by the pressure gauges. This was noted by both the District and Appellate Courts in their opinions, and is indisputable.

The infringement is full and complete. *No prior patent shows or suggests this combination of pressure behind the mass and jet action at the front of the mass* which is so vital to the present invention, and which petitioners find it necessary to use in order to produce an operative apparatus and method.

The patent is not limited to more than one compressed air pipe, and one or any number of them may be used. Two were originally used by petitioners, and their testimony that the use of two was discontinued some time after the infringement was commenced, is not clear

(Kennedy, Q34, R. 205, and Swartz, R. 230-231). The top air pipe was not disconnected for at least three years and until the spring of 1926 (R. 206 and 230) when the case was first called for trial. But this is all immaterial, since the patent describes and explains the method and apparatus in several of its claims, without requiring an air inlet at the top, and it is admitted that without the top air inlet it worked *in the same manner.* It had air pressure in the top, as well as at the outlet nozzle, the compressed air shooting up to the top from the lower nozzle, and establishing a body of compressed air there, behind the mass, *as soon as it was turned on.* (Opinion, A. N. HAND, J., R. 327, do. Appellate Court, R. 347-8, Kennedy Q81, R. 212, Dyer, R. 245, Swartz Q61, R. 235).

Respondent's apparatus made by its licensee, the Ransome Co., had a lower air inlet only (*Id.* 188).

12-13. Petitioners' apparatus is so far from the Goldie and other prior patents, that the assertion that it is "operated in exact accordance with" it, or them, merely indicates the extremes to which petitioners are willing to go in the absence of real defensive material. To summarize the Goldie patent, it has

(a) No pressure behind the mass (such a thing is not even suggested), and can have none because the vessel is not air tight,

(b) No means for getting the material out of the vessel, except its own feeble gravity,

(c) No jet or nozzle at or near the outlet, but merely a blast of steam or air remote therefrom, and down the narrow delivery pipe at a point to which the material must travel by gravity alone, and

(d) The vessel is isolated from the blast of steam or air by a length of narrow pipe.

It could not and was not intended to handle concrete, or any similar substance, and evidently could not be used practically for any useful purpose.

14. The statement that respondent's apparatus "operates precisely as does *all* the devices of the prior art" is self-contradictory. It would be impossible for one apparatus to operate as did any two of the different and variously operated prior devices—most of which could not operate at all.

The statement that respondent's engineer "blew" screenings through his machine has no relevancy, if true. If it will convey concrete the fact, if true, that it will convey something else tends to prove nothing against it.

15. The alleged prior use was an attempt to prove a use 22 years old by the oral testimony of two witnesses who had no contemporaneous records, apparatus, or other visible, tangible evidence whatsoever to support them or refresh their recollection, and they were fully contradicted and discredited. Their testimony was rejected by both trial and appellate courts.

The infringing apparatus in the Ulen suit was less like the illustrative embodiment of the patent than petitioners'. This will at once be apparent from an examination of the drawing of it (Ulen R., Exhibit D, 184). The Ulen device had a *horizontally* arranged vessel and employed a *piston or plunger* to move the concrete from the charging end of the vessel to the discharge outlet, whereas in the patent and in petitioners' apparatus the vessel is *vertically* disposed and does not employ a piston or plunger. In the Ulen apparatus the nozzle at the outlet was directed across the discharge duct, and not into it, as in the patent and petitioners' device.

There were also other differences. The Court held, however, that these differences were of form and not of substance, and that the Ulen apparatus was con-

structed and operated in substantially the same manner as that of the patent in suit.

The concrete used in the Ulen apparatus was the usual mixture employed for tunnel lining. It was "pretty soft" (Ulen, R. 118). All concrete is as wet as the contractor can make it under his specifications. The petitioners' concrete was of substantially the same character. The engineer's specifications called for concrete which had to be tamped or rammed. (Specification, Exhibit 19, R. 296, Kennedy Q15, R. 202) and petitioners induced the inspectors to permit "*a little* more water" (Q147, R. 220).

Petitioners' witnesses call it "liquid" concrete, but, of course, it was no such thing. There is no such thing as liquid concrete. Concrete is a mass of rocks with their interstices filled with sand and cement, and *cannot be* liquid. The so-called "liquid" concrete of the Smith 1872 patent is really nothing but concrete aggregates, so diluted in water that they will flow under pressure. But such a mixture is not concrete at all and will not form useable concrete.

The only fluent material in this general class is grout, which is a fluid composed of sand, cement and water, with no rocks. This can be made to flow through pipes by simple pressure behind it and in a solid column; and this is probably what Smith in 1872 had in mind, if, indeed, he knew anything about the subject. Concrete, being essentially a mass of small rocks or stones, will not flow any more than the rocks themselves will flow.

With the exception of this Smith paper patent of 1872, the same patents were in the Ulen suit as in the present suit. The Beach patent was pleaded in the answer (Ulen R. 8), but was evidently not considered of sufficient importance to be offered in evidence. This is also true of the Kolsche German patent 18,394.

The issues, therefore, in the Ulen suit were substantially the same as in the present suit, except that the present

infringing apparatus is closer to the embodiment illustrated in the patent, and is substantially a copy of the apparatus made by respondent under the patent (Ulen R. 183-4, 188).

ARGUMENT.

Brief Summary.

I. The patent in suit is for a pioneer invention, which solved a hard problem of long standing, conferred a great benefit on humanity, created a new practice in concrete construction and is acknowledged as such, actually and by its general adoption.

II. The invention operates in a peculiar and unprecedented manner, functions in a fashion considered impossible in the art, and produces a surprising and highly useful result which cannot be attained by any other means.

III. It has eliminated laborious, expensive and ineffective operations and accomplished work which could not have been consummated without it. Accordingly it has effected an enormous saving in all the work on which it has been employed and has made possible great enterprises which otherwise might have been unsuccessful.

IV. The original specification of the application fully disclosed the invention of the patent. The claims and the amplified disclosure of the patent are also supported by a supplemental oath.

V. There is nothing in the prior art that could have taught any one how to make and use the invention. The marked departure of the invention over the art is emphasized by comparison.

VI. The petitioners have used the apparatus of the patent, and have practiced the method described and

claimed therein. Their copying of respondent's commercial apparatus has been full and complete. Petitioners' subtle praise of the invention is emphatic.

VII. The decisions in the Second Circuit are correct on the facts and the law and should be affirmed. The decision in the Ninth Circuit is based on an erroneous conception and interpretation of the patent and the prior art relating thereto. It also accepts as evidence of prior art, matters which are not evidence at all. It should therefore be reversed.

I.

THE McMICHAEL PATENT IN SUIT.

The patent in suit is for a pioneer invention, which solved a hard problem of long standing, conferred a great benefit on humanity, created a new practice in concrete construction and is acknowledged as such, actually and by its general adoption.

In order to understand the patent we must first understand the nature of the material, structural concrete, in connection with which the patented invention is used, and the conditions which must be observed in handling that peculiar material.

Concrete consists of a mass of small rocks or stones in the form of crushed rock or coarse gravel, usually of a size which will pass through the holes of a screen having openings 1½ to 2½ inches in diameter. The defendants' rock in this case was passed through a 1½ inch screen (Kennedy, R. 214) or a 2 inch screen (Engineer's Specifications, Exhibit 19), which means that one diameter was 1½ or 2 inches and the other greater or less. The mixture was about 4/7ths rock, 1/7th cement and 2/7ths sand (Kennedy 237, R. 206)—a 1-2-4 mixture as it is called—and was therefore a mass of rock or gravel stones *with*

the spaces or interstices between the stones filled with wet sand and cement. The exact nature of the material is carefully specified in the patent (R. 285, lines 100-108).

These concrete mixtures weigh about 150 pounds per cubic foot, or a little more than *two tons* per cubic yard, and a yard or a half yard is usually discharged and conveyed in one batch. *It is as heavy as solid rock,* and *is* rock, in effect, in a plastic state.

Under most working conditions the concrete must be conveyed, long distances, around bends in the conduit and up to considerable elevations. In the petitioners' work it was conveyed *as much as 1,160 feet, around 14 bends of 90 degrees and up to elevations of 60 to 67 feet* (Kennedy R. 203). These conditions may be considered normal; and much harder conditions are sometimes encountered.

To this mixture of rock, sand and cement is added a small quantity of water, which should be sufficient only to *wet* the aggregates and hydrate the cement, causing it to act. Usually a little more water than is necessary to do this is used. In other words, there is a slight excess of water. The reason for this is that a little extra water makes the plastic concrete mixture more plastic and workable, and causes it to settle in the forms better and without much tamping or ramming. This is called "wet" concrete; the ideal mixture with no excess of water is called "dry" concrete.

But only a slight excess of water is ever properly permitted by engineers or inspectors who understand the subject, because it is well known that even a small excess of water will dilute the cement, rob it of its binding strength and leave innumerable flaws or "voids" to weaken the structure. Even a mixture so wet as to destroy the natural strength of the concrete almost completely *would not be liquid,* however, and would not flow like a liquid or semi-solid because *the mass of rock will*

not flow, but will merely *settle* or *pile up* in a heap. This would happen even if the finer parts of the mixture were so diluted as *to run out of the stones.*

The concrete aggregates must also be thoroughly and intimately mixed—usually in a highly efficient mixing machine—so that each stone and each grain of sand is coated with cement and the rocks are evenly distributed throughout the mass with the sand and cement intermingled with them *in uniform proportion at every point* (see Kirkland, Ulen R. 51).

The specifications under which the petitioners worked were very rigid as to this mixing, and made careful provision to insure a thorough and intimate mixture (Exhibit 19, R. 296). They also were particular as to the volume of water and the "plastic" character of the mix, which was such as to require "ramming," so that the mass would be "thoroughly compacted throughout." This was the usual "stiff" or "dry" concrete which is used for work requiring such strength and solidity as tunnel linings must have. Certainly it was not wet; and to say that it was liquid, in any sense, even with "a little more water" added, is absurd. And finally the concrete mixture must be transported and placed in the form *quickly*. It begins to set as soon as the cement is hydrated, even before it starts to dry, because the setting is a chemical action set up by the water. Thus the specifications for petitioners' work required that the "concrete shall be placed immediately after mixing "(Exhibit 19, R. 296, par. 163).

Concrete is therefore substantially plastic rock, composed of a mass of rock pieces carefully and intimately mixed with sand and cement and a small amount of water, is approximately as heavy as rock, is not fluent in any sense but must be moved bodily, and in such operations as lining tunnels must be transported quickly to and placed at great distances from the mixer and at high elevations through relatively small and winding pipes.

The McMichael invention handled this heavy difficult material perfectly under all working conditions by the seemingly impossible means of a small amount of compressed air.

It did this in the following manner:

1. By providing a closed, air-tight vessel or chamber (1 in patent), with a conical bottom 2, in which the concrete materials are deposited, through a sealing door (3), in a mass.

2. Providing for a body of compressed air in the chamber, behind this mass of materials, to press them into the contracted outlet and discharge duct of the chamber.

3. Providing a velocity jet of compressed air at the outlet to inject compressed air into the materials at that point, to force them into and through the discharge duct to the distant place of delivery.

In brief, the invention consists essentially in a method and means for conveying mixed concrete materials by establishing air pressure behind a mass of the materials in a closed chamber to compact them and force them into the outlet duct thereof, and simultaneously injecting a jet of compressed air into the outlet and the materials therein to drive them to the place of delivery.

The pressure behind the mass is substantially *static* and acts to compact the concrete and force it into the outlet, while the jet at the front of the mass is *dynamic. The combination of the two forces acting together on the mass is what does the work.*

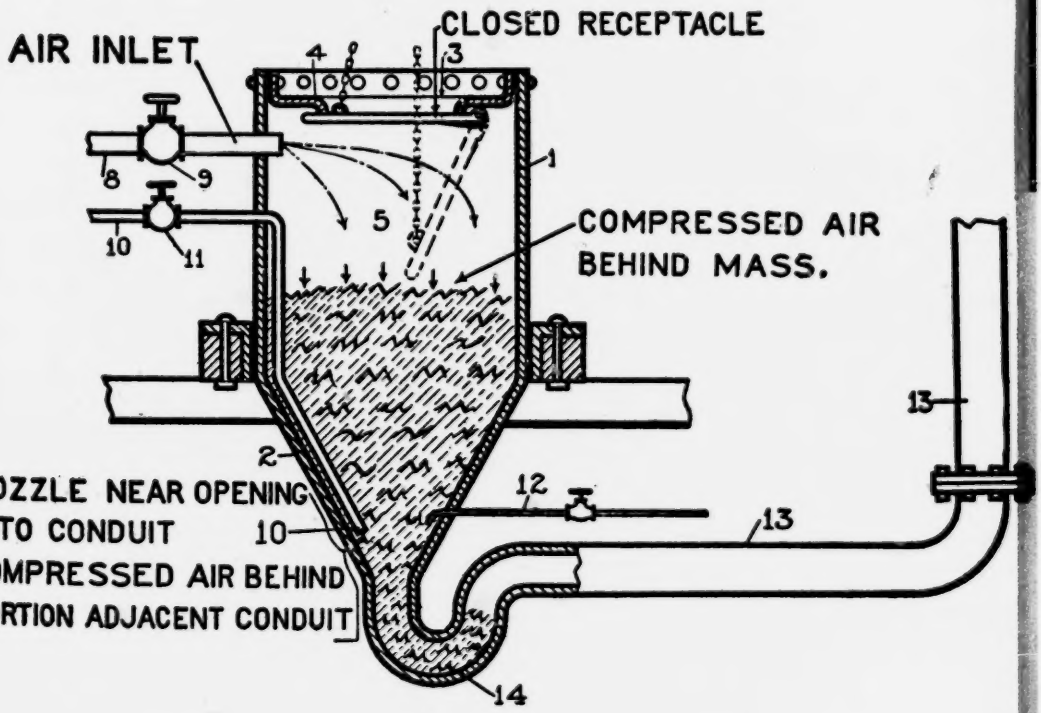
It will be noted that the materials are acted upon *as a mass* and not as separate particles, and that the mass is *never liberated* from this pressure, but is held under it and driven by it, without being broken up or

disintegrated, to any desired distance or elevation, substantially *intact*, and at high speed under air *pressure*.

The bottom jet is of course the most vital thing in the combination of instrumentalities or forces. But without the pressure behind the mass it could not work, and this pressure must be present at all times, either by the admission of air directly behind the mass or by such air shooting up through the mass from the bottom jet at the beginning of the operation and establishing a body of compression behind the mass. There must be a substantial balance of front and back pressure, one acting to a certain degree against the other to produce the necessary result.

The following cut, taken from the drawing of the patent, illustrates the essentials of the patented method and apparatus.

PATENT IN SUIT



In the cut the lower jet is the nozzle end of the compressed air pipe 10 which discharges into the neck or restricted outlet of the chamber or receptacle 1 and into the curved portion 14 of the conveying conduit 13. The top air pressure or "pressure behind the mass" is supplied by the pipe 8. The small pipe 12 "may" be used to inject a small amount of water, but is not used in modern practice, and need not be used at all unless the aggregates are placed in the chamber actually dry. The pressure behind the mass may be supplied in most cases by the air from the bottom jet or nozzle, as it will shoot up through the materials and *establish* a body of compressed air in the top, when the air is first turned on. The bend 14 is also usually unnecessary, but may be used if desired (Petitioners use such a bend; see Exhibit 3, R. 292). The top air inlet, bend in delivery pipe and little water pipe are *non-essentials*, and are included in certain specific claims only.

As shown in the patent, the compressed air is supplied to the discharging chamber from a pressure tank 6 supplied with compressed air by a compressor 7. The pressure is the same in both air pipes, 8 and 10, but is controlled by valves 9 and 11 on the pipes, so that the pressure and volume of air may be regulated.

The nature of the invention and the joint action of the two pressures are fully set forth in the specification of the patent. It says in part (p. 2, lines 46-58, R. 285):

> "It will be observed that the upper air pipe 8 serves merely to supply air to the upper part of the chamber 1, the pressure of the air being uniformly applied over the entire upper surface of the mass. The lower pipe 10, however, serves to direct a jet of air moving at a considerable velocity directly against portions of the mass as they move toward and into the discharge duct. The two pipes

> thus act in very different ways, the upper pipe supplying air which acts by pressure and the lower pipe supplying air which acts by velocity."

And again (*Id.*, lines 68-80):

> "Air from the lower pipe 10 may force itself into the body of the mass, and the relatively small air jet acting upon the relatively large stream of outward moving materials directly engages with the *sub-masses* to *push* them along. This action of the two air bodies in my apparatus is to be contrasted with the action of air in earlier devices which were so constructed that light materials such as grain or ashes could be caught in large moving air bodies and carried along *in suspension with each particle separated from the others.*"

The apparatus, therefore, and the method which it enables the user to carry out, acts by *pressure*, and *not by kinetic action or flotation*, which is a very different method, and was useless for handling concrete or any substance having relatively large heavy elements.

That the invention is peculiarly adapted to the handling of concrete is well specified. The nature of the mixture called concrete is carefully defined in the following language (*Id.*, lines 100-105):

> "As is well known, the material referred to as concrete is a composition containing relatively large pieces of rock or stone, as uniform in size as possible, together with predetermined proportions of sand, cement and water."

It makes no difference, however, whether the concrete is "wet" or "dry." The specification says (*Id.*, p. 3, lines 35-59):

> "It is more or less common practice to add an excess quantity of water in order to insure at least approximately complete coating of the rock pieces

> in as short a time as possible. This excess quantity of water not needed for crystallization must of course evaporate before the concrete can reach its final dry condition. One of the important advantages incident to the use of a device embodying my invention is that this undesirable excess of water can be reduced to a minimum or entirely eliminated, satisfactory coating of the rock pieces being found to be possible when the binding material is relatively stiff. While an apparatus embodying my invention is especially well adapted for the handling of a mass of concrete forming elements containing little or no excess of water, it will be understood that its use is not limited to the handling of such a mass. It is equally well adapted for the treating and handling of a mass containing a considerable excess of water in case such an excess is for any reason found desirable."

The invention therefore, not only makes the transportation and placing of this massive and unruly material possible, under all working conditions, but enables the contractor to use a minimum of the concrete weakening excess of water, without additional trouble or expense—possibly by the exercise of a little more skill and care.

The apparatus embodying the structural invention is defined variously in the claims. Of the claims involved in this suit, and in the Ulen suit (2, 4, 6, 17, 21, 22, 28, 34 and 35), claim 21 perhaps gives the best definition of the structural or apparatus invention. It reads:

> "21. In a device for treating and moving a mass of concrete forming materials, the combination of a chamber adapted to receive and contain the said mass, a discharge duct connected with the chamber, the said chamber having walls which gradually converge on all sides to the duct, and join the duct walls with substantial smoothness, means for supplying a fluid pressure agent to the chamber back

of a mass of materials contained therein, and means for directing a fluid pressure agent into the discharge duct in the general direction thereof."

Claim 2 is perhaps a little broader in some respects, particularly in that it is not limited to the walls gradually converging to join the outlet duct, but is more limited in that it specifies the separate air inlet pipe for producing pressure behind the mass, which claim 21 does not include. Claims 17, 34 and 35 also call for a separate top pressure means, but claims 4, 6, 22 and 28 do not. Claim 28 is perhaps the broadest apparatus claim on this point, specifying only "a pipe for delivering a jet of fluid pressure agent for propelling said concrete materials."

There are also other minor differences in the structural claims, but these need not be considered, since all these claims—and most of the other claims of the patent—*were embodied in petitioners' apparatus,* at least until the alleged disconnecting of the top air pipe, and apparatus claims 21, 22 and 28 were always embodied (Opinion 2nd, C. C. A., R. 347; Dist. Ct., R. 327).

The Method Claimed.

The invention also includes the method of handling concrete pneumatically which the apparatus, or other similar apparatus—facilitates. The apparatus, of course, must be employed in a certain way, or according to a certain formula, to produce the desired result, and this method or process of handling concrete so as to produce this remarkable result *is a distinct phase of the invention,* depending not on the particular apparatus but on the making of certain steps constituting a *method.* It is covered by a number of method or process claims, and is described generally in the specification, the operation being referred to on page 1, line 77 to page 2, line 99.

Some criticism of the process claims was attempted in

the Ulen suit, but this was disposed of by the District Court (Opinion, Ulen R. 401-2) with the statement that

> "The process claims are limited to *no particular form of apparatus* so that the contention that they are for a mere function seems without merit.
>
> *Expanded Metal* v. *Bradford*, 214 U. S. 366;
>
> *Buffalo Forge Co.* v. *City of Buffalo*, 255 Fed. 83."

(See discussion, Appendix, 129-137.)

The two method or process claims in this suit are 4 and 6. Claim 4, which is the broader, reads as follows:

> "4. The method of conducting concrete forming materials from a receptacle along a closed conduit connected therewith to the place where it is to be utilized, which consists in closing the receptacle, introducing compressed air behind the mass of materials and also behind the portion thereof lying adjacent the conduit, and thereby pushing the mass into and along the conduit."

Claim 6 refers more specifically to the materials as "a relatively compact and impervious *mass*," and refers to "injecting a jet of air under pressure into the *mass* at an angle to the line of movement of the *mass* into and through the said passageway."

These method claims, it will be seen, relate to the very essence of the invention. The invention is, primarily, a new *method* of handling concrete or similar materials, which consists essentially in transporting concrete by first applying air pressure behind a mass of it in a closed chamber to compact it and force it into the outlet thereof, then, at the same time injecting a velocity jet of compressed air into the portion of the mass packed in the outlet to dislodge it and the succeeding portions successively, and drive them along the conveying conduit to the distant point of placement.

This method was something new and entirely unprecedented in this or any kindred art.

There were two practices followed in the art of conveying materials pneumatically, and two only, viz.:

1. To feed the materials from a hopper in a small loose stream, usually by gravity, but sometimes with the aid of a limited air pressure to accelerate their gravitation and insure a complete discharge. The materials were so fed as to be dropped into a current or blast of air rushing through a large conveying conduit. The materials were loose and dry, or capable of being finely divided and floated in air like grain or sand. They gravitated from the hopper or vessel through a relatively *long narrow* downwardly extending pipe, and dropped into the air conveyor pipe in a *small stream*, which was taken up by a large air current in the delivery pipe, *disintegrated and floated*. This was known as the *flotation* or *kinetic* method.

Examples of this practice are found in the Farnham, Warren and Goldie patent, hereinafter discussed.

2. To make a column of *liquid* flow through a delivery pipe—sometimes with small solids carried therein—by simply putting air pressure behind it. This could not be done with dry materials on the one hand or solid or non-fluent materials on the other hand. It was practiced with *fluids* in various arts.

Examples of this practice are found in the Canniff and McIlvrid patents and the Smith 1872 "paper" patent. Canniff and McIlvrid used grout, a *liquid* mixture of sand, cement and water, which would flow like thin porridge. Smith proposed to make a *liquid* of concrete aggregates by adding *three-fifths* of the volume of water, and forcing the liquid by simple air pressure behind it. If it worked at all, it destroyed the value of the concrete mixture. That this proposed substance was a *liquid* is conclusively shown by the fact that he proposed to have it flow *by gravity* along through a narrow, winding passage (d)

from the mixer into the forcing chamber (F), and by the fact that he used a chamber with a *flat bottom* and a discharge pipe in the middle of that bottom. *Nothing but a liquid could be thus conveyed and flowed out of the chamber.* Furthermore, he *calls it* a "liquid" and a "fluid" which will "*flow freely.*"

None of these prior patentees conceived the idea of packing the mass of material by pressure behind it and forcing it into a contracted outlet, and there injecting into it in its packed condition a velocity jet to cut off successive portions and drive or "shoot" them through a long conveying conduit—like projectiles in an air gun, or a solid plug carrier in an air-tube conveyor.

The conception of this plan is what made the pneumatic transportation of concrete possible. It could not be floated in air, and if it could have been, such floating and disintegration would have destroyed the mixture, causing the large heavy aggregates and the fine lighter aggregates to separate and be delivered, if at all, not as a concrete mixture, but as separated masses of grout or "soup" and rocks. (See Ray, Ulen R., Exhibit D, 124-7 and R. 262-6.)

Judge AUGUSTUS N. HAND, in the District Court in the *Ulen* case, after a long trial, and again in the present case, after another long hearing, in the course of which the respondents' apparatus was actually operated, found that the kinetic discharge of concrete was *impossible.*

In the first suit he said, *inter alia,* referring to the earlier blowing, devices:

> "They were kinetic devices for floating light material." * * * It is not accomplished by a heavy air *pressure* as in the patent in suit, but by an air or *steam* velocity" (Ulen R. 397; 12 Fed. [2] 929).

In the second and present case, he says:

> "Moreover, if air were floating the concrete it

> would be bound to pass through the pipe and the pressure would be so rapidly reduced that the heavier portions would be left in the pipe."

And again:

> "As for the point raised that patents for kinetic devices are pertinent prior art, it is answered by *the fact* that neither the patent in suit nor the defendants' device are kinetic in operation" (R. 327).

As to liquid conveyance, it is simply out of the question. Even if concrete could be so conveyed it would have to be first immersed, and destroyed as concrete. Moreover, none of the liquid conveying apparatus employs the all-essential *velocity jet at the outlet.*

II.

HOW THE McMICHAEL INVENTION WORKS.

The invention operates in a peculiar and unprecedented manner, functions in a fashion considered impossible in the art, and produces a surprising and highly useful result which cannot be attained by any other means.

In the foregoing discussion of the invention as set forth in the patent its working has been described. It is therefore only necessary under this heading to call attention to the relation of this working to the important results attained. This may be summarized as follows:

1. As we have seen, the body of concrete is a mass of rocks with the interstices filled with a similar proportion of sand and cement, the whole intimately mixed and proportioned to secure an even distribution of all the aggregates throughout the mass. This is essential to the strength and usefulness of the concrete and must be insured by care and precision (Pat. p. 2, lines 108-122, R.

285 and Kirk., Ulen R. 50, Q54). After the concrete is mixed, its mixture must not be disturbed, but must be preserved intact.

Prior to the patent in suit, concrete was taken from the mixer and conveyed in barrows or cars and sometimes by other mechanical conveyors to the point of placement. This was done as quickly as possible, to prevent setting of the concrete before placement, and care was taken to insure against separation of the aggregates en route.

But concrete weighs about 150 pounds to the cubic foot or over two tons to the cubic yard and is not easy to handle, even in mechanical conveyors. Such conveyors, however, are still used for ordinary building purposes. It is also raised in a tower and distributed to various parts of buildings by means of steep gravity chutes or conduits, down which it slides, without separation, by gravity.

2. In tunnel work, however, the concrete must be conveyed great distances from the mixer, and placed between the rough wall of the tunnel—sometimes braced by rough beams—and a steel form set inside the rough tunnel and spaced usually from eight to twelve inches therefrom. The purpose is to fill in the rough wall of the tunnel, re-enforce it and present a smooth, even interior surface. This is called tunnel lining, and is necessary in practically all tunnel work on account of the uneven character of the bored and blasted wall, its weak spots and the frequent occurrence of water veins.

The forms used in tunnel work are as much as 120 feet in length, and are spaced a foot or less from the rough wall (Bateman, Ulen R. 116). *It is therefore impossible to do such work by hand,* as men cannot crawl in between the form and the tunnel wall and work. Nor can they work more than a few feet beyond their reach; and even at that, they cannot place the concrete in a satis-

factory manner where there are beams, or recesses in the tunnel wall, and the relatively feeble packing force exerted by human strength is insufficient even if the workmen are diligent and careful (Kirkland, Ulen R. 52-53).

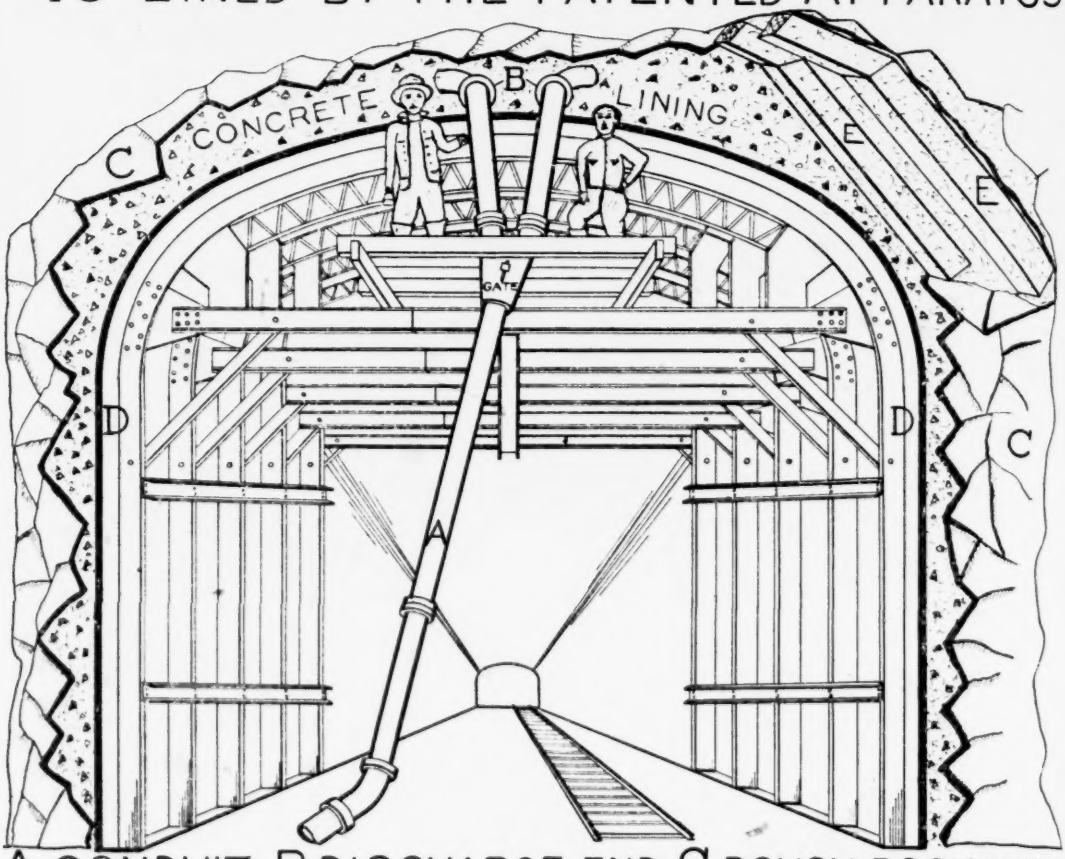
Mr. Kirkland says in part, referring to the work done by the patented apparatus (*Id.*):

> "Q64. Is it possible to produce that effect by human agency, by hand?
>
> "A. No, sir."
>
> * * * * * *
>
> "Q69. Then by hand can the concrete be placed properly behind the beams or other supports for the natural roof of the tunnel?
>
> "A. Oh, no; that would be impossible."
>
> * * * * * *
>
> "Q71. How about the expense?
>
> "A. The cost of placing pneumatically is, in ordinary tunnels, not done under air pressure, *from one-half to one-third* of the cost of doing it by hand or by other means."
>
> * * * * * *
>
> "Q99. But was it common to line tunnels with concrete prior to 1907?
>
> "A. Yes, sir.
>
> "Q100. Well, was there or was there not need for an effective means of lining those tunnels?
>
> "A. Yes, sir, the cost was very expensive" (*Id.* 57).

The expense of doing the work by hand in tunnels under air pressure was even greater and less effective (Kirk., Q3, R. 276).

The following cut shows the method of lining tunnels by the apparatus of the patent in suit, and is a drawing made from photographs of one of the C. B. & Q. Tunnels lined with it, Exhibit 6 (Ulen R. 185).

How a Tunnel Is Lined by the Patented Apparatus



A-CONDUIT B-DISCHARGE END C-ROUGH ROCK WALL
D-STEEL FORM E-BEAMS TO BRACE WALL

In this operation the concrete is shot from the distant mixer, through the conduit A, into the narrow, uneven space between the rough tunnel wall C and the steel form D, by means of the placing pipes B inserted between the said wall and form, until the entire space is filled with concrete. The form is then contracted and moved back, and another section filled. The workmen who manage the placing pipes are on a platform, outside the form, and shoot the concrete in through the placing pipes a distance from twenty to one hundred and twenty feet.

The terrific force of the concrete issuing from the placing tubes, *packs it solid*, so as to save tamping or working—which would be impossible here—and insures a solid concrete lining.

3. The concrete, as we have seen, is placed where it cannot be placed by hand, placed better than it possibly could be so placed and at one-half to one-third the cost of the inefficient hand-placing under the most favorable conditions.

The McMichael invention has saved many millions of dollars in tunnel work, has made such work possible where it could not otherwise have been done, and has protected human life and property, in every section of the United States, as well as in foreign countries.

The respondents admit this wonderful utility in the article published in the Engineering-News Record describing their work and inspired by them (Qs120 and 121, R. 217) and identified by them in answer to interrogatories (R. 10-20) where they say:

> "100 per cent. of the stuff that goes into the mixer is shot into the forms no matter how far the forms are away from the shooter."

And again:

> **"In short, concreting has been done where it could not be placed by hand; and the machines have produced better and more finished jobs."**

4. **With the patented machine the previously mixed concrete is compacted in the chamber by the pressure behind the mass, forced and packed into the outlet, cut off and shot any desired distance, to any ordinary elevation, around bends of the conveying conduit and delivered at the forms *intact*.**

The machine will discharge a yard, or two tons, of

concrete in *ten to twenty seconds*, and convey it at the rate of a *mile a minute* (Kirk., Ulen R. 49-52). The distance of conveyance appears to be almost unlimited. In one instance (Twin Peaks Tunnel, San F.) it was shot and placed 4900 feet, or nearly a mile. (*Id.*)

A reading of Mr. Kirkland's description of the wonderful performance of the patented invention (Ulen R. pp. 49-53) is earnestly recommended.

All these facts concerning the wonderful work of the invention are undisputed.

It seems almost a miracle that a workman without doing anything more than to open a little air valve, can hurl tons of concrete per minute great distances and to high elevations, around obstacles, and place them intact to form solid concrete, without any other effort.

III.

THE GREAT WORK AND UNIVERSAL USE OF THE INVENTION.

It has eliminated laborious, expensive and ineffective operations and accomplished work which could not have been consummated without it. Accordingly it has effected an enormous saving in all the work on which it has been employed and has made possible great enterprises which otherwise might have been unsuccessful.

The great usefulness of the invention has been in the construction of tunnels, bridges, and dams, where the nature of the work is such that it cannot be done, or cannot be done properly and safely, by hand or by mechanical means. **In this important field the apparatus and method of the patent in suit have solved a great and long standing problem, superseded all other means and gone into general use.**

The following résumé of the *undisputed* testimony as to its work and the unusual difficulties encountered in such work (see Kirk., Ulen R., Exhibit D, 48-53) will be sufficient on this point.

1. Concrete weighs about 150 pounds per cubic foot or two tons per cubic yard (Ulen R. 48).

2. This concrete must be transported distances up to a mile, around obstacles and to considerable elevations, and delivered *intact* to the forms. Illustrations are the Twin Peaks Tunnel, where it was shot nearly a mile, the Dennison Viaduct, Cleveland, where it was elevated eighty feet (strangely enough it is easier to transport the concrete upward than horizontally, *id.* Q47), and the petitioners' work in which it was shot 1100 feet, to an elevation of 67 feet and around as many as fourteen right angle bends in the pipe (Kennedy, R. 203).

3. A ton of concrete is discharged and sent on its way in a few seconds, at the rate of a mile a minute, or nearly 100 feet per second (Kirk., Ulen R. 51).

4. It must be transported and placed quickly, before it has a chance to set.

5. It must be driven home and packed so as to fill every space and crevice, and ram itself into solidity. This is done by the great momentum due to the weight and velocity of the concrete (*id.* Q63, p. 52).

6. It is impossible to do such work as this by hand (*Id.* Qs67-69).

7. Where the work *can* be done by hand the patented invention saves from one-half to one-third the cost (*Id.* Q71), and in some cases a much greater saving is effected (Q3, R. 276).

8. The concrete must be thoroughly and intimately

mixed, so that the rock is surrounded by the cement and sand and a homogeneous mixture produced (Ulen R. 50, Q54).

9. This intimate mixture must not be disturbed; and the patented apparatus does not disturb it but preserves it (*Id.*). It even tends to improve the mixture or make it more thorough on account of the internal agitation of the masses as they shoot through the conveying conduit (R. 111). There is also a mixing action in the chamber when the compressed air is first turned on and the air from the bottom jet shoots up through the mass to establish or equalize the top pressure (*Id.*).

10. Tunnels and similar works were commonly lined prior to 1907, *but at great labor and expense* (Kirk. Qs97-100, Ulen R. 56). There was therefore great need for the invention, and great difficulty in overcoming the obstacles in such work, some of which were unsurmountable.

The reasons why the invention has supplanted all other means in this work, and gone into general use, are therefore apparent. That it has gone into general use is established (Kirk., Q23, Ulen R. p. 45).

The novel character of the invention is shown by the fact that the greatest difficulty in inducing engineers to use it was that they first regarded it as *impossible, and even ridiculous*, until they saw it demonstrated (*Id.* Qs12-14 and 22, Ulen R. 44).

The merit of the invention has been generally acknowledged by manufacturers of concrete machinery, and the patent has been respected by them (Robinson, Ulen R. 66).

The following list of *some of* the important works on which the McMichael apparatus and method have been used will indicate its immense importance, and the great benefit conferred by it on the public. These are from the testimony of Mr. Kirkland (Ulen R. 46) and Mr. Rob-

inson for the respondent's licensee, the Ransome Company (*Id.* 65). A long list is given in the Ulen record (R. 187 and 191-2).

The Roosevelt Dam, Arizona.

Pennsylvania Railroad tunnels under New York Harbor.

Chicago (Wilson Avenue) water tunnel, extending eight miles out under Lake Michigan.

New York subways.

Twin Peaks tunnel, San Francisco.

Muscle Shoals Dam, Alabama.

Los Angeles and Salt Lake Railroad tunnel.

Southern Pacific, Union Pacific and C. B. & Q. Railroad tunnels.

Shandaken Aqueduct tunnel, fourteen miles under Catskills (by Ulen Co.).

Vehicular tunnels under New York Harbor.

Queensboro subway extension (done by Petitioners).

The invention has also been used in foreign countries (Robinson, Ulen R. 65-66).

The work mentioned was all prior to the trial of the Ulen suit in 1925. Since that date the extensive use has continued (Kirk. Q4, R. 276).

This wonderful success of the patented invention is not due to advertising or salesmanship. Engineers who have in charge great works involving enormous cost and upon which human life and property depend, do not take chances, or yield to the persuasion of advertisements or salesmen's talk.

The invention has succeeded by reason of its performance.

With these facts in view, his Honor, Judge A. N. HAND said in the *Ulen* case (Ulen R. 401):

> "His device has displaced all other methods for rapidly and economically conveying, lifting and placing concrete at long distances from the initial

> source of supply and has been used in numerous great enterprises. In such circumstances his claims should be read broadly and given a fair range of equivalents."
>
> *Concrete* v. *Ulen*, 12 Fed. (2) 929, 931.

And Judge SWAN, writing the opinion of the Circuit Court of Appeals in this case said, after referring to the patent in *Concrete* v. *Gomery*, 269 U. S. 177, in which the apparatus of the patent was merely an adaptation which had been made before, in substance:

> **"But that is a very different situation from the one before us in the Ulen Case where nobody before McMichael had ever used a pneumatic apparatus to transport concrete." (R. 344.)**

This fact taken with the fact that the patented apparatus has gone into universal use (Kirk. Q23, Ulen R. 45), shows the true character of the invention.

IV.

The original specification of the application fully disclosed the invention of the patent. The claims and the amplified disclosure of the patent are also supported by a supplemental oath.

The facts which establish this point may be summarized as follows:

1. The drawing of the McMichael patent in suit is the identical drawing which was filed with the original application therefor. Not a line, and not even a reference numeral, has been altered.

2. The original specification of the application described the construction and operation of the apparatus with sufficient fullness "to enable any person skilled in

the art" (U. S. R. S. 4888) to make and use the same. Any person following the original drawings and specifications would have made *a practical, fully operative apparatus,* embodying the improvements, and would have realized the invention, as to both the apparatus and the process.

3. The additions to the description merely made it fuller and gave a better explanation of the operation and great usefulness of the invention, so that persons, skilled in the art, *could better realize and take advantage of its great usefulness for concrete.*

4. The original object of the invention was stated with sufficient clearness in the following language:

> "The invention has for its object to provide an apparatus for elevating and transporting material of the character mentioned, in a more expeditious manner and with greater facility than is possible by the employment of ordinary methods" (File Wrapper, Ulen R. 199).

The mention of ordinary *methods* shows that the original specification writer intended the public to understand that the invention had to do with a method, as well as a mechanism.

5. The original description specified "*concrete*" as a "building material" which the invention was designed to elevate and transport. The fact that McMichael contemplated transporting other material, "such as sand, plaster, mortar," *as well as concrete,* and so states, does not in any way narrow the invention. Rather the elimination of these other materials made his invention, as finally described and claimed, *more limited and specific* than the original disclosure. The inference is that he found that his invention was peculiarly adapted for the handling of concrete, but not for the handling of these other materials and, therefore, limited and restricted his improve-

ments to apparatus for handling *concrete alone*. It may be that he found his improvements *not well adapted* for the handling of sand, plaster and mortar and, therefore, cancelled reference to these materials. Whether it will handle these materials or not is, however, immaterial. If the method and apparatus differ from earlier methods and apparatus, and operate in a different manner to produce a useful result, *it makes no difference what materials are operated on*. Nevertheless, the fact that they will elevate and transport concrete, proves that there was a great difference, in view of the fact that this material *had never been transported pneumatically before*, and has since been *universally* transported by the invention to secure wonderfully beneficial results.

6. The claims of the original application also covered the apparatus as described and claimed in the final patent. **There was no abandonment of any part of the invention in the Patent Office.** On the contrary, the invention originally claimed was adhered to and claims defining it insisted upon throughout.

The application shows numerous actions, arguments and amendments, an interference proceeding, a lapse and renewal after allowance and changes in ownership, so that it was pending in the Patent Office for eight years. **During this period, however, the invention was steadfastly adhered to.**

Thus Claim 2 of the patent is for substantially the same subject-matter as Claim 3 of the original application, and remained in the application, with only small changes in form from beginning to end. This claim is one of the apparatus claims involved in this suit. It reads—

> "2. In combination, a chamber for containing concrete forming materials, a conduit leading therefrom, a compressed air inlet pipe connected to a part of the chamber remote from the conduit, and

> another compressed air inlet pipe leading through the chamber wall and terminating within the chamber near the opening into the conduit in a nozzle directed toward said opening."

Claim 3 of the original application (Ulen R. 202) reads as follows:

> "3. In an apparatus for elevating and transporting granular and plastic building material, a receiver having its lower portion in the form of a hopper, means for supplying air under pressure to the upper portion of the receiver, a tube connecting with the lower end of the hopper to convey the material therefrom, and an air pipe to deliver air at the lower end of the hopper, substantially as described."

It will be seen that these claims are substantially the same in substance and meaning, and that they differ only in small details.

About two years after the application was filed it became involved in an interference, and the subject-matter of this claim was included in the second claim, Count 2, of that interference in the following language (*Id.* 215):

> "Count 2: In combination, a chamber for containing plastic concrete, a conduit leading therefrom, a compressed air inlet pipe connected to a part of the chamber remote from the conduit, and another compressed air inlet pipe leading through the chamber wall and terminating within the chamber near the opening into the conduit in a nozzle directed toward said opening."

The interference was decided in favor of the present patentee, McMichael, and this claim remained in the application, which was allowed (Ulen R. 277), permitted to lapse and finally renewed in January, 1911, within a year after its allowance.

On the renewal, the specifications were amended, and new claims added, but the four claims in the application on its original allowance, *including the claim above quoted and the two method claims*, were retained (Ulen R. 266).

Thereupon numerous objections were made by the Patent Office to the *new* specifications and claims (Ulen R. 233), and a new oath as to Claims 1 and 4 and some of the new claims required. The claims formally allowed were neither objected to nor rejected on the merits and remained in their original form. One of the originally allowed method claims read as follows (*Id.* 215):

> "4. The method of conducting freshly mixed concrete from the mixer along a closed conduit connected therewith to the place where it is to be utilized, which consists in closing the mixer, introducing compressed air behind the mass of concrete and also behind the portion thereof lying adjacent the conduit, and thereby pushing the concrete into and along the conduit."

It is the original form of Claim 4 of the patent and corresponds in scope and substance to that claim, which is apparently the broadest of the method claims in the patent.

Amendments, arguments and official actions thereupon followed, but Claims 2 and 4 above quoted were not rejected, and were amended slightly in language only, *without changing their scope or meaning* (Ulen R. 259), and finally were allowed with the other claims in the patent in 1914 (Ulen R. 278).

Claim 2 of the patent is therefore substantially Claim 3 of the original application. It was never really rejected, was only canceled on the substitution of a claim of the same scope and meaning (Amdt. April 5, 1909, Ulen R. 213), and slightly amended to make it more clearly define

the invention, voluntarily and without any requirement on the part of the Patent Office.

The "2d" claim rejected by action of February 4, 1908, was the *original* second claim which had been renumbered 1 (see Amdt., Ulen R. 299), and not Claim 2 of the patent or its predecessor, which was originally *Claim 3* and was renumbered 2 (Ulen R. 208). It is true that in action of March 9, 1909 (*Id.* 211), the Examiner said at the end of the letter: "The claims are all rejected," but as he immediately followed this up with a declaration reciting that claim in substance and holding it *"allowable,"* this general rejection had no effect (Act'n Mar. 25, 1909, *Id.* 212). And when the applicant promptly adopted this claim as formulated by the Examiner, on April 5, 1909 (*Id.* 213), it became an allowed claim in the case.

It will be noted that Claim 4 of the patent, for the method, had its origin in the four allowable claims formulated by the Examiner and suggested to the applicant on March 25, 1909, the applicant being "limited to twenty days in which to file them" (*Id.* 212). So that from March, 1909, to the final allowance of the application, *these two important claims for the apparatus and the method were in the application and held allowable*, were never rejected at any time on the merits, and were only slightly amended by the applicant to clarify them or make them more specific. In fact, the only objection of any kind made to them was that they should be supported by a new oath.

The other apparatus and method claims involved in this suit appear to be for substantially similar subject-matter as Claims 2 and 4, and are therefore embraced within the scope of these claims.

7. **Even if new matter was added to the application, it was covered by McMichael's supplemental oath filed February 17, 1912** (Ulen, R. 241, 251-3). This oath quoted Claims 4 and 6 of the patent, recited Claim 2 of the patent,

in substance (see Fourth, Third and Second quoted claims respectively), and recited nine other claims containing the substance of all the claims of the patent. (See First and Fifth quoted claims.) In the oath he swears that this subject-matter originally

> "* * * was part of his invention, was invented before he filed his original application, above identified, for such invention, was not known or used before such invention, was not patented or described in a printed publication in any country more than two years before his application, was not patented in a foreign country on an application filed more than twelve months before his application, was not in public use or on sale in country for more than two years before the date of his application, and has not been abandoned" (*Id.* 251).

The claim, therefore, that any part of the invention—either method or apparatus—was improperly added to the application is wholly without merit.

The only objection to new matter in a patent application is under the section of the patent statutes (U. S. R. S. sec. 4892) which requires that,

> "The applicant shall make oath that he does verily believe himself to be the original and first inventor or discoverer of the art, machine, manufacture, composition or improvement for which he solicits a patent; that he does not know and does not believe that the same was ever known or used; and shall state of what country he is a citizen."

And, if any matter, added to the application, after it is filed, is not fairly disclosed in the original application and covered by the original oath, it may fail to comply with this section. Therefore, it is customary, where any question has been raised, to file a supplemental oath covering such alleged new matter. *This McMichael did;* and, in doing so, he removed all question concerning

either the apparatus or process claims of the patent. **It is significant that this supplemental oath is not referred to in any way in the extended arguments of petitioner concerning the alleged new matter in the McMichael patent.**

That the original specification was brief, and did not go into the theory of construction or operation in detail is entirely immaterial.

It frequently happens that an applicant when he files his original application *does not fully understand the principles involved,* and it is the rule with most really new inventions that their full nature and purport are at first not understood. It is well within the rights of an inventor to more fully explain and elucidate, and even elaborate, his original disclosure, so long as he does not inject thereinto claims not fairly readable on his original disclosure.

Thus in *Diamond Rubber Co.* v. *Consolidated Rubber Tire Co.*, 220 U. S. 428, 435, this Court said:

> "A patentee may be badly empirical, seeing nothing beyond his experiments and the result; yet if he has added a new and valuable article to the world's utilities, he is entitled to the rank and protection of an inventor. And how can it take from his merit that he may not know all of the forces which he has brought into operation? It is certainly not necessary that he understand or be able to state the scientific principles underlying his invention, and it is immaterial whether he can stand a successful examination as to the speculative ideas involved. * * * (Citing numerous cases.) * * * He must, indeed, make such disclosure and description of his invention that it may be put into practice. In this he must be clear. He must not put forth a puzzle for invention or experiment to solve, but the description is sufficient if those skilled in the art can understand it. This satisfies the law,

> which only requires as a condition of its protection that the world be given something new and that the world be taught how to use it. It is no concern of the world whether the principle upon which the new construction acts be obvious or obscure, so that it inheres in the new construction" (55 L. Ed. 527, 530).

And in *Cleveland Foundry Co.* v. *Detroit Co.* the Circuit Court of Appeals for the Sixth Circuit said (131 Fed. 853-857):

> "It is true that the patentee did not fully perceive nor correctly perceive, as we think, the principles on which the operation of his burner proceeded. For instance, we more than doubt whether he appreciated that the principle of gravity cooperated in the method of his invention. But he did see and know that the burner he had devised would successfully accomplish the results he anticipated and was laboring for. *It is clear enough that while the application was pending he came to understand the operation of his device better than he had, and that his first claim was founded on that better understanding.* These are the essential facts on which the issue as to whether such new matter was brought in and claimed as would defeat the validity of the claim must be tested. We think the issue must be determined in favor of the patent. In the case of Michigan Central R. R. Co. *v.* Consolidated Heating Co., 67 Fed. 121, 14 C. C. A. 232, we had occasion to consider the question of the validity of amendments made while the application for a patent was pending. We there held that the validity of such an amendment depended upon the question whether it brought in original matter, *or was of something that might be fairly deduced from the original application.* In the first instance the amendment would not be justified; in the latter it would. The case was decided upon that distinction. And this is the rule which is elsewhere recognized. Hobbs *v.* Beach, 180 U. S. 396, 21 Sup.

> Ct. 409, 45 L. Ed. 586; Western Electric Co. *v.* Sperry Electric Co., 58 Fed. 186, 7 C. C. A. 161; Sugar Co. *v.* Yaryan Mfg. Co. (C. C.) 43 Fed. 140. This distinction harmonizes with the doctrine that the benefit secured by an invention extends to all the uses of which it is capable, whether the inventor had them all in contemplation or not, and the other rule, to which we have already referred, that it does not matter that he does not understand the principles on which his device operates. If he discovers new uses to which his invention may be put, *or discerns the principles thereof more clearly, while his application is pending,* in neither case is there any new invention, nor any enlargement of the old. And that being so, there can be no legal objection to his so molding his claims as to secure all his invention discloses."

See also:

Schaum, et al. v. *Copley-Plaza Co.*, 260 Fed. 197, 201 (affirmed by 1st C. C. A., 269 Fed. 140);

General Electric Co. v. *Cooper Hewitt Co.* (C. C. A., 6th), 249 Fed. 61, 64;

General Electric Co. v. *Morgan Gardner Co.*, 168 Fed. 52;

De la Vergne Co. v. *Featherstone*, 147 U. S. 209, 229 (distinguishing *Eagleton Co.* v. *West Co.*, 111 U. S. 490, 498).

And the Second Circuit Court of Appeals in *Westinghouse* v. *Metropolitan*, 290 Fed. 661, adopted the same rule, in a very carefully considered opinion, the gist of which is stated in the following language (665):

> *"Result is that a claim fairly derivable from a sworn disclosure is good, whether originally presented or introduced by amendment; and such claim needs no supplemental oath."*

The Court has even held that claims deliberately

omitted from a reissue application, and thus expressly "abandoned," may be reinstated in a second reissue.

> *Autopiano Co.* v. *American Player Co.*, 222 Fed. 226.

And in all the cases above cited on this point, except the last, which related to a reissue, *there was no supplemental oath,* whereas in this case there *was* a supplemental oath expressly covering the subject-matter of the broader claims in the patent.

The Decision of His Honor Judge Learned Hand, Shows That the Objections That New Matter Was Inserted and That the Original Invention Was Abandoned Have No Merit.

In deciding these questions on the hearing of these segregated issues (see Opinion, Ulen R. 13), Judge HAND said, on the question of abandonment, that the defense rested upon a *misconception of the authorities* referred to, which establish two doctrines not related thereto. He said (*Id.*, R. 14):

> "The first doctrine is that on reissue no claims can be inserted which had been made and rejected in the original application. The second is that in the interpretation of claims a patentee may not insist that they shall be read as equivalent to claims in whose rejection in the Patent Office he acquiesced. *Neither of these doctrines has anything at all to do with claims which have been once rejected and in substance resolicited and allowed while the application is still pending.*"

He then goes on to say that an applicant may amend his claims as often as he pleases while the application is still pending, and then says (*Id.*, R. 15):

> "The patent is *in fieri* until it is allowed; the proceedings, * * * are negotiations between

> two contracting parties, till their conclusion open to modification by either side. When the bargain is struck the patent issues and the claims are frozen, but not before."

The objection based on the alleged absence of a supplemental oath to new matter need not be considered, since the patent contains no new matter, and a supplemental oath *was* filed as to matter which the Examiner thought was new, but without admitting that such matter was new in fact (*Id.*, R. 241). Judge LEARNED HAND, however, overrules this objection on the authority of *Westinghouse* v. *Metropolitan*, 290 Fed. 661.

THE NON-OBVIOUS CHARACTER OF THE INVENTION.

That the applicant had difficulty in making the Patent Office understand the true nature of his invention, and that it was also doubted by practical workers in the art, who required evidence of successful use and demonstration, only goes to show that the invention was unusually obscure. In this case the applicant found it necessary to file with the Patent Office a description and illustration of the working of the invention published in "Engineering News" showing the construction therewith of the La Salle St. tunnels, under the Chicago River (Ulen R. 249); and, as we have seen, Mr. Kirkland and other engineers thoroughly experienced in concrete work, including concrete tunnel work, refused to believe that the handling of concrete pneumatically was possible (Qs12 and 22, Ulen R. 44 and 45).

A similar case is that of the Ashmore & Morgan patent for the well known concrete roller and process for finishing concrete pavements which was sustained in *Macon Concrete Roller Co.* v. *Brooks-Callaway Co.*, 272 Fed. 341

(affirmed 279 Fed. 114). In his very able discussion of the invention Judge SIBLEY says (272 Fed. 344):

> "The conception was new. The practical contractor to whom it was first presented very emphatically expressed his contempt of it. The Examiner of Patents in his first letter of May 2, 1916, rejecting the claims said:
>
> "'The action of the roller is believed to be inconsistent with the applicant's insistence upon the lightness of the roller.'
>
> "Only by the exhibition of numerous testimonials to the actual performance of the method and device was approval secured."

The File Wrapper here shows, however, that the inventor fully understood the true nature of the invention, and its mode of operation during the prosecution of the application in the Patent Office. This is established by the various statements made by his attorney during the prosecution of the application and in his arguments distinguishing it from earlier patents cited. Thus, in the argument filed March 29, 1913, McMichael's attorney, referring to the Smith patent (Ulen R. 299), which belongs to the same general class as the other prior patents hereinbefore discussed says (R. 267):

> "The Smith apparatus is constructed for handling light grain which can be and, in his case, is handled largely by the action of air *circulating in and through the interior of the mass* to act separately on each grain berry to engage it and push it along. The action in the Smith apparatus can be described as the suspension of relatively small light particles in a large and relatively slowly moving body of air. In applicant's case the materials to be handled, instead of being light separate bodies such as grain berries, are large heavy bodies such as pieces of rock which are mixed with finer sand and cement

> particles and also with water which causes the whole mass to cohere and to become more or less solid and impervious. The air can act *on the mass* only by pushing bodily against *large portions* of it and *not by acting separately on the individual particles which comprise the mass.* In considering these claims the Examiner is asked to bear this distinction very clearly in mind."

Here we have a clear statement of the peculiar operation of the patented apparatus and method in acting upon the material *as a mass* instead of breaking up the mass, and in handling the entire mass *bodily* instead of circulating through and disintegrating the mass and acting on the separate particles. This is what the claims call for and what the apparatus is designed to do, and what no other apparatus even sought to accomplish.

Appellee's witnesses describe this action in their testimony, and it is fully explained by appellee's expert, who emphasizes the point that in the apparatus of the patent the material is not disintegrated or separated into its particles, as is the material handled by the earlier patents, but is handled *as a mass,* forcing it into and along the conduit substantially intact (Ray, R. 262-4, and Q7, Ulen R. 127-121).

The reason why this must be done is that if the concrete mixture of rock, sand, cement and water were broken up, the larger elements would separate from the smaller, and the materials would be entirely separated (*Id.,* R. 261, Q24).

There is, of course, a certain degree of *internal* mixing of the elements in each little cylinder or sub-mass of concrete, which tends to more thoroughly mix them as they travel along the conveying conduit at high speed and under pressure, and are acted upon by the friction of the conduit walls. This is the "mixing" referred to in

the patent (p. 3, lines 120 *et seq.*), where it says that the bend in the pipe

> "also slightly checks the advancing mass or sub-masses to assist in preventing the water or other ingredients from separating from the general mass because of difference in specific gravity" (Spec. p. 4, lines 8 *et seq.*).

Mixing, however, is expressly disclaimed in the present patent (p. 3, lines 99 *et seq.*).

It may be that the patentee did not fully understand that the jet at the outlet would be required *in all cases or at all times*, and this may be the reason for the statement in the original specification that

> "To loosen the material at the lower end of the hopper should the same become packed, I provide the additional air pipe adapted to discharge air through the material" (Ulen R. 201).

It is quite apparent, however, that before the prosecution of the application had proceeded to any extent he fully understood that the air pressure behind the material to pack it and the jet at the outlet to detach and boost separate sections of it were necessary—except possibly where the material was discharged down hill—and that their automatic and constant co-action were essential to the operation of the device.

That McMichael from the beginning understood and intended to insist upon the radical difference between his method of conveying such substances as concrete in mass, and the prior air floating and liquid flowing devices, is shown by his first argument in the application. Thus, in the argument of June 18, 1908, he refers to the former as showing "elevating means which depends upon the *current of air carrying* the material along," and in speaking of the latter says that it, "although suitable for *liquids*, is obviously not to be employed for elevating mixed concrete material" (Ulen R., Exbt. D, 206).

V.

THE PRIOR ART.

There is nothing in the prior art that could have taught any one how to make and use the invention. The marked departure of the invention over the art is emphasized by comparison.

The heavy, rocky, homogeneous material known as plastic concrete could neither be floated on a blast of air, nor caused to float by gravity or pressure like a fluid. Nor could it be broken up or unmixed or mixed with a body of water for transportation. Its character and requirements made it necessary that it be conveyed and placed substantially intact. Here was an apparently insoluble problem, and although various other materials had been conveyed pneumatically for at least thirty years, and the desirability of pneumatic conveyance of concrete was well recognized (see Smith 1872 patent), up to the time of McMichael's invention no means for doing it had been devised.

Thirty prior patents have been used by the petitioners-defendants in an attempt to anticipate the McMichael invention, part of them being found in this record and part of them in the Ulen record, which was introduced in evidence by the petitioners as Exhibit D (R. 31). *Their very number indicates their weakness.*

All of these prior patents, as we have seen, are included in two distinct classes:

1. Patents for air flotation or kinetic apparatus and methods in which the material is *disintegrated* and *floated* in a current of air.

2. Patents for causing fluids to flow under pressure in a column.

Of the patents finally relied on here by the petitioners, the following are flotation or kinetic:

Beach, No. 267,318 of Nov. 14, 1882 (R. 305);
Farnham, No. 747,396 of Dec. 22, 1903 (Ulen R. 347);
Warren, No. 671,303 of Apr. 2, 1901 (Ulen R. 329);
Goldie, No. 707,840 of Aug. 26, 1902 (Ulen R. 335);

and the liquid column patents are:

Smith, No. 122,497 of Jan. 2, 1872 (R. 297);
Smith, No. 122,498 of Jan. 2, 1872 (R. 300);
Caniff, No. 873,345 of Dec. 10, 1907 (R. 318);
McIlvrid, No. 958,421 of May 17, 1910 (R. 323).

The patent in suit belongs to a third and distinct class, not found in the prior art, in which neither air flotation, nor liquid column movement is employed, but in which concrete or the like (90% insoluble solids) is first placed under pressure behind a mass of it in a vessel, and thus compacted and forced into a narrow outlet, and then cut off and shot through a conveying conduit by air pressure applied at this outlet and behind its masses.

The Beach patent No. 267,318 of November 14, 1882 (R. 305), shows a "pneumatic conveyer" for conveying "*grain, flour, etc.*" (R. 307, line 23), which consists of bins EE, with small bottom outlet pipes leading to a common small outlet pipe F, through valves R, discharging into a "pipe, tube or box G" (R. 306, line 36), which has an "open end" communicating with an air reservoir A, and which is "filled with air, either by free communication with the surrounding atmosphere at its natural pressure,

or with air condensed to any degree of elasticity required" (*Id.*, line 31).

The grain, flour, etc., flows by gravity or by pressure, or both, from the reservoir A, through a small outlet pipe to the pipe, tube or box G, where it is carried "while in a state of *suspension in the air* in the tube" (*Id.*, line 16) to an exhaust apparatus—suction box—K. The operation is described as follows (R. 307, lines 29-35):

> "*The grain and flour or other article* thus introduced into the moving current of air will rush with the current *in suspension* through the tube G with that velocity with which air under great pressure will seek to fill a vacuum, which vacuum will at all times be maintained, as nearly as practicable."

The apparatus is distinctly one for floating grain, flour and other light, dry, finely divisible materials in a current of air to a suction or vacuum chamber. *The bottom jet at the discharge opening of the chamber and the other essentials of the patent in suit are entirely lacking*, and the apparatus is entirely incapable of handling any such substance as concrete, *in any manner*. It can operate entirely by suction, which means at most a pressure less than 15 pounds (Ray R. 274).

The Farnham patent No. 747,396 of December 22, 1903 (Ulen R. 347), shows a "*sand-blast*" apparatus, or in other words, an apparatus for producing *a blast of sand carried in a current of air*, for cleaning or other purposes. The sand is first placed in a tank 1 with a flat bottom and a small, downwardly extending discharge-pipe 2 in the middle of this flat bottom. At the lower end of this small discharge-pipe there is a "sand carrying hose 6 of any desired length to lead to the point of application of the

sand blast" (Spec., p. 1, line 75), and "an air-blast pipe 7" with a

> "nozzle or jet 11, which enters the coupling, so that its point of discharge will lie *below the discharge-mouth of the discharge-pipe 2*, leading from the tank, the best results being obtained when its point of discharge is *about midway* of the discharge-mouth of the discharge-pipe" (*Id.*, lines 92-98).

The patent says that

> "the sand will pass from the reservoir or tank *by gravity alone* or by gravity aided by compressed air within the reservoir under regulation" (*Id.*, lines 17-20).

The specification points out that by positioning the air blast nozzle midway of the discharge-mouth

> "the air is projected *across the mouth* of the discharge-pipe 2 without the blast passing up into the discharge-pipe and at the same time creates *a suction* across the discharge-pipe and down through the same, so that the downflow of the sand through the pipe is greatly facilitated" (*Id.*, line 100, etc.).

The specification further states that if back pressure were not prevented by this suction

> "it would not only retard the downflow of the sand, but it would also result in the sand becoming *moist* from condensation of the compressed air, *and thus the pipe would become clogged*" (*Id.*, p. 2, line 9, etc.).

It is also stated that

> "The inclination of the coupling at the lower end of the discharge-pipe also aids in the rapid flow

of the same from the mouth of the discharge-pipe" (*Id.*, line 15, etc.).

It is distinctly a device for conveying dry sand to make a blast by air flotation, the sand being discharged from the tank by gravity aided by suction and perhaps a limited pressure of air in the tank which "may be entirely cut off from the tank" (*Id.*, line 25).

The features which make it entirely unuseable for anything but dry, finely divided material are the following:

The tank with flat bottom;

The long narrow outlet pipe;

The absence of a velocity jet at or near the tank outlet;

The positioning of the blast and suction midway of the discharge-mouth of the outlet pipe, and

The small caliber of the pipes employed.

It was never intended to be used for any such substance as concrete and could not be so used. Its teachings would have *misled* anyone seeking to solve McMichael's problem and taught him to attempt the use of suction, disintegration and flotation—and failure.

The Warren patent No. 671,303 of April 2, 1901 (Ulen R. 329), is for another sand-blast apparatus which is called "mixer for sand-blast apparatus."

Like the Farnham patent it shows a reservoir or hopper A with a small discharge-pipe D at its bottom through which the materials pass from the reservoir to a chamber E in a pipe G through which a current of air passes. As in both Beach and Farnham, the finely divisible material is fed through a discharge-pipe in a *small stream* into the air pipe, when it is taken up and floated along by the air. The Warren patent says (p. 1, lines 63-71):

"The operation of the device is as follows: Air is admitted through the pipe G into the chamber

> E, and the valve F being open permits sand to pass from the hopper through the pipe D into the chamber and into the blast of air, *with which it mingles and by which it is carried through the chamber into the flexible tube M and discharged through the nozzle O.*"

It is another flotation device in which the fine material mingles with the air and is floated along by it. In this and the two preceding patents there is *no pressure nozzle at the outlet, no combination of pressure behind and at the front of the mass, and no operating upon the material as a mass.* The plan in all of them is to *distintegrate and float* the loose material, which is *the antithesis* of the patent in suit.

The Goldie patent No. 707,840 of August 26, 1902 (Ulen R. 335) shows another apparatus for propelling finely divided material—in this case dry cement or cement mixed with sand—in a state of disintegration in a blast of air. The apparatus consists of a "funnel" 16 with a small discharge-pipe at the bottom, extending downwardly, and through which the material must flow *by gravity alone* to a point where the

> "steam-pipe 17 projects into the interjector-pipe or hose 13,"

with which the outlet-pipe is connected (Spec., p. 2, line 123).

This steam-pipe takes up the small current of dry materials, and blows them through the pipe or hose 13 to a space under railroad ties, where they are supposed to set and reenforce the ballast. A small water pipe 20 may be used to moisten the cement and sand, which is properly proportioned will form a sort of grout.

There is no pressure behind the mass in the funnel, *and none possible or intended,* and the dry cement powder, mixed or unmixed with sand, must find its way down the little pipe in a loose state, where it will be inflated, moistened and driven to its destination in the steam or air from the pipe 17. It appears to be a purely chimerical scheme. To attempt to handle anything like concrete in this manner would result in nothing but failure and discouragement.

These patents do not teach the use of a pressure jet "within the chamber near the opening into the conduit" or "within the discharge duct" as the claims of the McMichael patent specify, and as petitioners have copied. They teach the use of a jet or a blast of air at a point distant from the opening or outlet between the chamber and the discharge duct. The air has no influence on the material in the outlet or "opening into the conduit" from the chamber.

The petitioners have located their jet in this opening, exactly where the patent places it, and where it must be placed to be operative. They have therefore followed the patent in suit and not the prior art, well knowing that the difference is the difference between failure and success.

The Court of Appeals for the Second Circuit after considering the prior patents and finding that **"nobody before McMichael had ever used a pneumatic apparatus to transport concrete,"** says (Opinion, R. 344):

> "The Warren and Farnham sand-blast machines (patents No. 671,303 and No. 747,396) could not have been so used without increasing the size of the discharge pipes and cutting off the sand-blast nozzles. **To do this was to make a new machine,**

> **and one who thought of doing it would have had a new and inventive idea; that is, that of blowing concrete, which had not been done before. When that is so, the physical change in the apparatus need be very little to sustain a patent.** The only reason why a new use is not patentable is that the law grants patents only for new things, not for new ideas. Similarly Goldie's machine (patent No. 707,840) for blowing cement could not, so far as appears, have been used as it stood for concrete, and never was so used."

The Smith patents No. 122,497 and No. 122,498 of January 2, 1872 (R. 297 and 300), purport to be for improvements in concrete pavements, and machinery for same, but are evidently for *a crude and worthless idea.* They are what are commonly called *"paper patents,"* and gave the art no solution *or practical suggestion of a solution* of the problem of conveying concrete pneumatically.

The first Smith patent is for concrete consisting of a mixture of concrete aggregates with a "quantity of water equal to about *three-fifths of the entire mass* of materials already commingled" so that "the whole is of a *fluid* character capable of *flowing freely* through pipes and of being run into covered molds" (R. 297, col. 2, lines 7-14). It is evidently the result of the *ignorance* of the nature and requirements of a concrete mixture. Such a freely-flowing, fluid mixture *would not form concrete, but a crumbling mass,* with the stone or gravel largely separated from the cement and sand. No such fluid mixture as this could be used to form concrete.

The second Smith patent shows a mixer for this liquid "concrete," from which the liquid mixture is supposed to flow by gravity, *through a winding, narrow passage d*

into a flat-bottomed forcing chamber F, from which the liquid will flow by gravity or by air pressure on to a roadbed. The outlet from the chamber F is *in the middle of the flat-bottom.* Therefore, only a *thin liquid* could be properly fed to chamber F and discharged therefrom. Furthermore, there is *no jet at the outlet or anywhere else.* The patent therefore lacks *the most vital and essential feature* of the patent in suit.

The Smith patents, instead of tending to anticipate the patent in suit, emphasize its novelty. They show that at least *thirty-five years* before McMichael solved the problem, the provision of means for pneumatically conveying concrete *was sought;* and that it was not found, despite the presence of numerous—probably hundreds—of inventors with this problem in mind during that period of thirty-five years.

In fact, the Smith patent was never heard of for more than *fifty years,* and until these petitioners, after appropriating the invention of the patent, sought an excuse for it.

The Smith patent taught the art nothing for thirty-five years, and never would have added anything to the sum of practical human knowledge.

The Court of Appeals for the Second Circuit in disposing of this Smith patent said (R. 344-5):

> "The new evidence of the patent art upon which appellants rely to distinguish the Ulen decision includes two patents granted in 1872 to W. H. Smith. No. 122,497 is for an improvement in concrete pavements and claims concrete 'prepared for use in a liquid or semi-liquid condition, capable of flowing in pipes and running into molds.' No. 122,498 discloses a machine for mixing liquid concrete and

conveying it by a discharge pipe from the mixer to the spot where it is to be laid. The concrete is to flow through the discharge pipe by gravity, or as an alternative, after flowing by gravity through a small winding passage into a chamber, F, is to be forced into the discharge pipe by the passage of steam or compressed air admitted into the chamber above the mass of the concrete. The chamber has a flat bottom of large area relative to the size of the discharge pipe, the outlet of which opens into the center of the bottom. While this machine discloses the idea of forcing concrete through a pipe by compressed air, *whether it was practically operable may well be doubted.* It would seem that a large quantity of the concrete, or at least the stones of which it is partly composed, would necessarily accumulate upon the flat bottom of the chamber. *In any event, it was very different from McMichael's device, which injects air into the concrete at its entrance into the discharge outlet. It cannot be regarded as an anticipation.*"

The Canniff and McIlvrid patents are merely for machines for discharging grout, a thin liquid, composed of sand, cement and water, which is forced in a column through pipes, like any liquid. They also lack the vital and important element of the bottom jet.

The Kolsche German patent No. 18,394 of 1881 (*Concrete* v. *Storrie*, Exhibit Book, pp. 183 and 658), regarded as an anticipation in the *Storrie* case (No. 528 here), is merely another *flotation* patent showing an apparatus for conveying "granular material" such as "slack" (usually coal-screenings—Stand. Dict.), "sandy or granular material *by means of a current of air.*"

It was *pleaded* by the defendants in this case (R. 6) and by the defendants in the *Ulen* case (Exhibit D, p.

9), but was evidently not considered of sufficient importance to warrant its being offered in evidence or discussed. It shows a kinetic device, and one in which light or finely divisible material is floated and driven along by a current of air produced "by means of a blower." The current, as usual, is merely "of such strength that the *particles dropping* down through the opening c.d. are engaged and carried along through the entire air passage d.e." It would be impossible to convey any such substance as concrete in such an apparatus, and even if it could be, the mixture would be destroyed. No suggestion of such a thing is found in this old foreign patent. Furthermore, the outlet jet, so vital to the McMichael invention, or its equivalent, *is entirely lacking.* The fact that the District Court and the Court of Appeals in the *Storrie* case regarded this flotation jet-lacking device of the old German Kolsche patent as an anticipation, *is evidence of their misconception of the true character of the present invention.*

The Duckham British patents No. 4,400 of 1875 and No. 15,348 of 1885 (*Storrie* case, Exhibit Book, pp. 598 and 606) are for *liquid column* apparatus. They relate to dredges and dredging in which mud and other substances dredged are floated in a column of water through a conduit merely by pressure behind the liquid column. This is an old scheme, and although it was used for at least thirty years prior to McMichael's application, no one—barring Smith in 1872—ever proposed to use it for concrete or the like; **and no one having any knowledge of the character and requirements of concrete would propose such a thing.** To use it would be to destroy the concrete mixture absolutely in order to convey it.

Nor do the Duckham patents show or describe such a thing as a nozzle at the outlet. The mere suggestion

that nozzles at the bottom of a huge tank of liquid pointed towards its outlet *may be used* for stirring up the mud, etc., means nothing. It would mean nothing even if these were United States patents and not foreign patents, and even if the apparatus were a compressed air apparatus for conveying concrete. The **location** of McMichael's jet or nozzle *near the opening into the conduit*, is absolutely essential, and without it his invention is not present. **It was the conception of the importance of this nozzle and its particular location that made the McMichael invention and its wonderful work possible.**

Here again, in citing the Duckham patents as anticipations, the Court in the *Storrie* case shows an entire misconception of the character of the present invention.

Collectively these prior patents fail to teach the vital and essential features of the McMichael invention, viz.:

A mass of concrete with pressure behind it, pressing it into a restricted outlet, and a velocity jet injecting air into the compacted mass in the outlet to drive it through the conveying conduit.

There is not in any of them any showing of any arrangement or method for handling concrete—or any other material—by forcing a mass of it into a narrow outlet of a chamber, and there shooting into the mass a jet of air, the forcing pressure and the jet pressure co-acting simultaneously on the mass in the vessel and its outlet.

VI.

INFRINGEMENT.

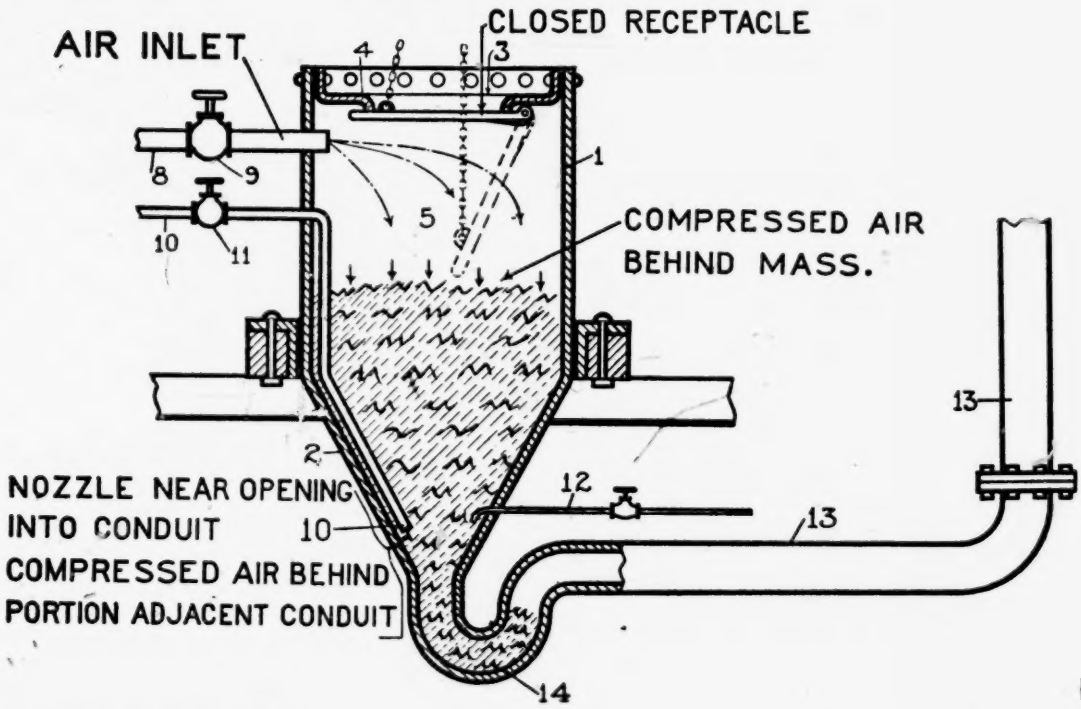
The full embodiment of the patented invention in the petitioners-defendants' apparatus is so clear that there is hardly room for serious argument.

The petitioners have used the apparatus of the patent and have practiced the method described and claimed therein. Their copying of respondent's commercial apparatus has been full and complete. Petitioners' subtle praise of the invention is emphatic.

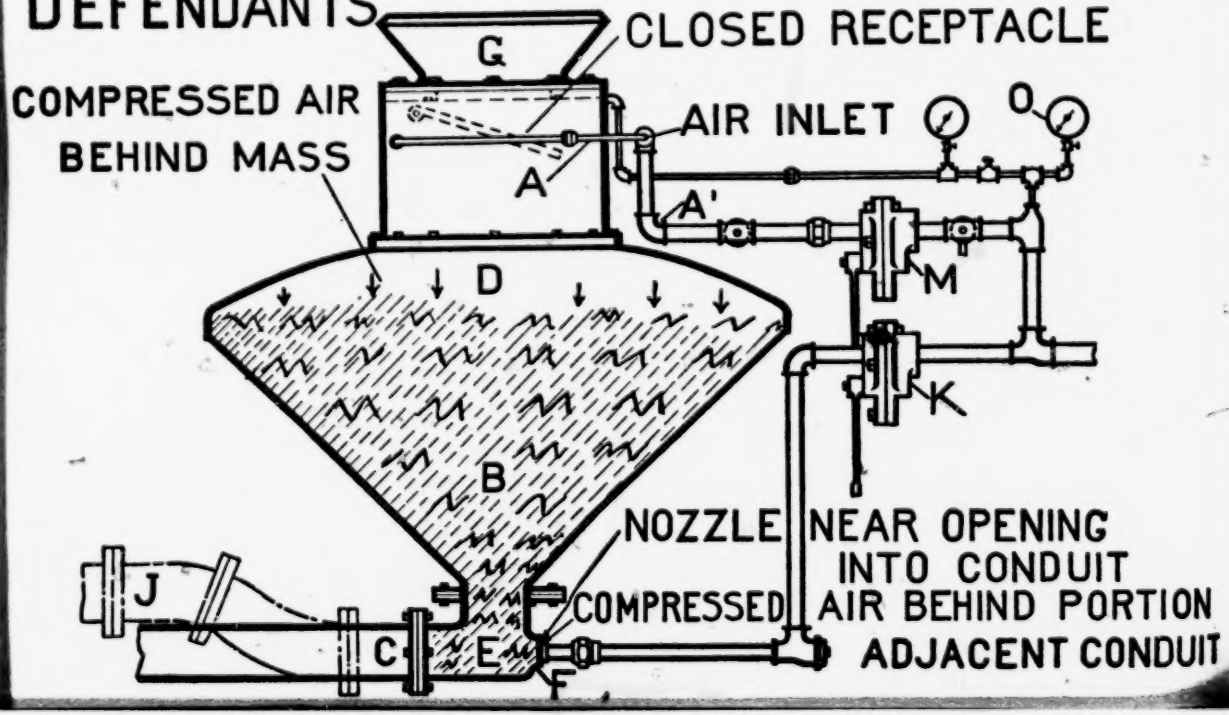
In fact the defendants' apparatus here is *a substantial reproduction* of the apparatus of the patent in suit, No. 1,127,660, which differs from the illustrated embodiment of the patent in unessential details and proportions only. It is constructed on the same plan and operates in exactly the same manner to produce exactly the same result.

For the convenience of the Court we here reproduce in their essentials the apparatus of the patent in suit (R. 384) and the petitioners' apparatus as shown in Exhibits 3, 4 and 5 (R. 292-4), so that their full correspondence can be quickly seen. The cut is from Exhibit 4.

PATENT IN SUIT



DEFENDANTS



The defendants' apparatus is also illustrated in the photograph of it (Exhibit 3, R. 292), made while it was in actual use, reproduced in Engineering News-Record and identified by the petitioners at the trial and in answer to interrogatories (R. 20), and in the second drawing, Exhibit 5 (R. 294).

Exhibit 4 shown in the foregoing cut of defendants' (petitioners') apparatus was also (reluctantly) identified by the petitioner Fleck at the trial and the construction and operation explained (R. 22-27).

The same nine claims relied on in the *Ulen* case (2, 4, 6, 17, 21, 22, 28, 34 and 25) and there held to be valid and infringed, are relied on in this case, and were found to be infringed. Nine other and additionals claims (5, 8, 9, 12, 15, 19, 24, 31 and 32) were declared on in this case (R. 21 and 282), but in view of a question raised by the defendants as to whether the case was tried on these additional claims, a decree under them was voluntarily waived (R. 328) and a decree entered under the original claims only.

The petitioners' apparatus and the method practiced by them with it infringes *nearly all* the claims of the patent in suit; but the claims recited in the decree are sufficient.

Each and all of these nine claims are fully embodied.

The following claims are quoted, because they appear to be characteristic definitions of the process and apparatus of the patent, and also because they are obviously infringed by the petitioners' apparatus *from the beginning to the end* of its use by them.

> "4. The method of conducting concrete forming materials from a receptacle along a closed conduit

connected therewith to the place where it is to be utilized, which consists in closing the receptacle, introducing compressed air behind the mass of materials and also behind the portion thereof lying adjacent the conduit, and thereby pushing the mass into and along the conduit.

"6. The herein described method of treating and conveying a relatively compact and impervious mass of concrete forming materials which consists in positioning the mass in a chamber connected with an extended outlet passageway, applying air pressure behind the mass within the chamber to force it toward the outlet passageway, and injecting a jet of air under pressure into the mass at an angle to the line of movement of the mass into and through the said passageway.

"21. In a device for treating and moving a mass of concrete forming materials, the combination of a chamber adapted to receive and contain the said mass, a discharge duct connected with the chamber, the said chamber having walls which gradually converge on all sides to the duct, and join the duct walls with substantial smoothness, means for supplying a fluid pressure agent to the chamber back of a mass of materials contained therein, and means for directing a fluid pressure agent into the discharge duct in the general direction thereof.

"22. In a device for treating and moving a mass of ingredients for forming concrete and containing relatively large pieces of material, the combination of a relatively large discharge duct, a pressure chamber for receiving the said ingredients of the concrete mass, said chamber having walls which gradually converge to the discharge duct and join the duct walls with substantial smoothness, the parts being arranged to have pressure exerted upon the material within the discharge duct from the

surface of the mass in the chamber on lines extending directly into the discharge duct.

"28. In a device for treating and delivering a mass of materials for forming concrete, the combination of a chamber, a discharge duct communicating with the chamber, a pipe for delivering a jet of fluid pressure agent for propelling the said concrete materials, a manually controllable valve in the said pipe, the said pipe being arranged with its receiving end outside of the said receptacle and with its delivery end outside of the discharge duct but adapted to deliver the jet of fluid agent to the interior thereof, the interior of the said discharge duct being thus left substantially unobstructed."

The remaining claims (2, 17, 34 and 35) specify "a compressed air inlet pipe" for supplying compressed air "remote from the conduit" (Claim 2) or "means for supplying a fluid pressure agent to the chamber back of a mass of materials," in addition to the means for directing it "into the discharge duct" (Claims 34 and 35), or "near the opening into the conduit" (Claim 2), and as it is claimed by the petitioners that this top air inlet was disconnected at some time prior to the end of the infringing period—but long after the suit was instituted and after this case was on the Trial Calendar of the Court—these claims are not quoted here.

Even if petitioners' claim is correct, they infringed all the claims until shortly before the trial of the case, as they had this top air inlet all along—though they claim they did not use it part of that time—and infringed five of the nine claims for the entire period.

The Court of Appeals for the Second Circuit expressly held infringement of these five claims (4, 6, 21, 22 and 28) during the entire period (Opinion, R. 348).

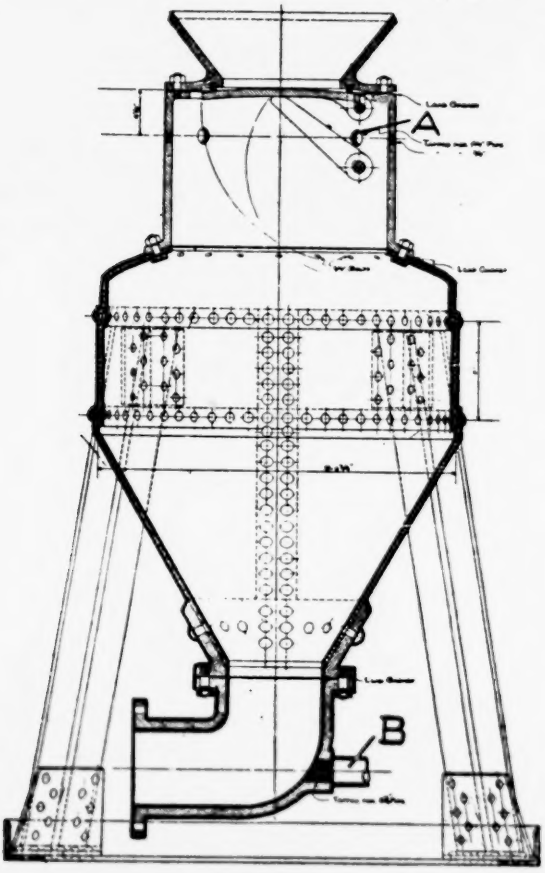
Comparing the claims with the petitioners' apparatus (see foregoing cut and Exhibits 3, 4 and 5, R. 292-4) we have the following:

> (Claim 4) "Closing the receptacle" (by top door between G and D), "introducing compressed air behind the mass of materials and also behind the portion thereof lying adjacent the conduit" (through pipe F or pipes A and F) "and thereby pushing the mass into and along the conduit" (C, J).
>
> (Claim 21) "A chamber adapted to receive and contain said mass" (D), "a discharge duct connected with the chamber" (C, E), "the said chamber having walls which gradually converge on all sides of the duct" (at B), "means for supplying a fluid pressure agent to the chamber back of a mass of materials contained therein, and means for directing a fluid pressure agent into the discharge duct in the general direction thereof" (at F or at both A and F).

The other claims above quoted are equally well embodied.

The petitioners' apparatus is a substantial copy of respondents' commercial apparatus. This is shown by the following cut made from the illustration of respondents' apparatus, which is Exhibit 5 in the Ulen suit, and is printed at page 184 of the record (Exhibit D) in that suit. It was identified by Mr. Kirkland, for the respondent, at page 43 of the Ulen Record.

Respondents Commercial Apparatus



As frequently happens, the respondents did not go to the patent to learn how to infringe, but simply imitated the apparatus made under the patent, and so successfully used in numerous great enterprises.

The commercial apparatus, as will be seen, is a full embodiment of the invention. The mass of materials is placed in the vessel, and compressed air is admitted to the top of the vessel to establish pressure behind the mass through the air inlets A, thus compacting the mass and forcing it into the lower end of the vessel and its outlet.

Compressed air is then turned on at the outlet nozzle B, so that a velocity jet is injected into the concrete packed in the outlet, to loosen it or break it and drive it in masses, by air pressure, through the conveying conduit. The compressed air from the nozzle B is directed into the outlet of the vessel, and behind the portion of the mass "lying adjacent to the conduit" (Claim 4). The opening into the conduit is immediately in front of the nozzle," and the nozzle is "directed towards said opening" (Claim 2). The jet from the nozzle is also injected "into the mass at an angle to the line of movement of the mass into and through said passageway" (Claim 6).

The fluid pressure from the jet is also directed "into the discharge duct in the general direction thereof" (Claim 21), and the other requirements of the claims are also fulfilled. *The vessel or chamber extends to the point E* where the vessel and the discharge conduit are joined in defendants' (petitioners') machine as illustrated, there being a separate elbow member at this point *which forms, in effect, a part of the vessel and a part of the discharge duct;* and the nozzle F is directed into this opening and into the discharge duct and the mass packed therein, to dislodge it and drive it through the conveying conduit.

The operation may, of course, be performed by turning on the air at the bottom first or turning on both simultaneously, or—less efficiently, perhaps—by turning on the bottom jet only and establishing the top pressure by the air shooting up through the mass in the closed chamber at the start of the operation.

The nozzle in both respondent's and petitioners' commercial apparatus is therefore not in the conveying conduit, but at the opening from the vessel into that conduit, where the mass of materials in the vessel is packed by the pressure behind the mass.

The complete embodiment is shown by the testimony of the petitioner Fleck, who was subpoenaed at the trial, and who (reluctantly) identifies the vessel in which the concrete was contained as D (Qs9-12, R. 23), the compressed air inlet pipe which was used to admit air to the upper part of the chamber and behind the mass of materials as A (*id.*, Qs14-18), the compressed air inlet pipe used to admit compressed air adjacent the conduit as F (*id.*, Qs34-36), and the door used to close the vessel as between G and D (*id.*, Qs42 and 43). He also identifies H and G as a hopper arrangement for admitting concrete into the vessel, M as the valve controlling the top air inlet, K as the valve controlling the lower air inlet, O as the pressure gauge on the air supply pipe and N as the air pipe by which the door is closed (*id.*), *and admits fully the operation of the apparatus in the manner described in the claims.*

Defendant Fleck also identifies the blue-prints of the drawings, Exhibits 4 and 5, which were produced by him under subpoena, as correct illustrations of defendants' machines (Q59, R. 27). They are the manufacturer's drawings, from which the machines were built.

That the apparatus is a full embodiment of the patented invention is also admitted by defendants' managing officer, Mr. Kennedy, in his final answers to plaintiff's interrogatories (R. 10-20). These interrogatories referred to descriptions and illustrations of the defendants' machine published in the Engineering News-Record and the Com-

pressed air Magazine in 1925, the year after this suit was commenced, and among other things show a cut of the pneumatic concrete placing machine (Exhibit 3, R. 292) and describe its general operation in the following language (R. 18):

> "Placing Concrete."
>
> . . . . . .
>
> "Essentially the gun, as shown by Fig. 12 [R. 292] is a conical drum with charging and discharge connections and with valves and air connections. When charged with concrete the proper *valves* are operated, air is turned on and the batch *is forced out of the drum* and driven through the discharge pipe line to the point of deposit. In the subway operations the air pressure has ranged from 65 to 80 lb. It has been possible to shoot a batch a minute. With the three outfits 160 cu. yd. of concrete have been placed in a shift. A 6-in. discharge pipe line has been used in all instances. The maximum delivery which the work will require is 1,500 ft. So far one of the larger guns has delivered through 1,160 ft. of pipe, with nine right-angle bends, to a height of 57 ft. above the drum. At the end there was a vertical lift of 24 ft. It will be noted that the gun is not depended on for any mixing action, it is simply a device for delivering concrete already mixed in the regulation manner."

And the interrogatories were (1) whether the article did not "*correctly describe and illustrate the work now being carried on* and carried on since the grant of the patent in suit and prior to the commencement of this suit by the defendants in the Southern District of New York as stated therein" and (2) whether the said article did not "*correctly describe and illustrate the work carried on by the defendants at the time and place stated* in the last question under the heading 'placing concrete'" (R.

10), thus directing attention to the particular subject of the machine and its operation.

The interrogatories were answered May 10th, 1926 (R. 20), and the answers, which were in *the affirmative*, therefore cover a period of nearly three and one-half years prior to that date (beginning December, 1922, R. 201), and up to the time the case was on the trial calendar of the Court. The Engineering News-Record article was published February 12, 1925 (R. 10), the year after this suit was commenced, and after the defendant had been using the infringing apparatus *for more than two years.*

These magazine articles were, of course, published largely on behalf of the defendants-appellants to advertise the character of the work being done by them and its excellence. Mr. Kennedy personally gave the writer of the magazine article all his materials (XQs120, 121, R. 217). The construction and operation described is therefore that which existed and was carried on *prior to February, 1925, and at least until the case was called for trial in May, 1926.*

A reading of the foregoing quotation from the magazine article with the cut (Exhibit 3, R. 202) before us will be sufficient to show that *the embodiment of the patented invention was complete in every respect.*

The concrete is dumped into the vessel D at G, the door between G and A closed, air admitted at A through the pipe A^1 controlled by valve M, and air admitted to the bottom outlet through pipe F controlled by valve K. The concrete is forced down through the contracted lower part D of the vessel to the outlet E and there cut off and driven to and through the conduit C, J, to the point of placement.

The operator at the right in the picture with his hands

on the controls is Mr. Kennedy's best operator, Swartz (R. 230).

The actual construction and operation of appellants' machine is fully described in the testimony of plaintiff-appellee's expert, Mr. Ray, a man of the highest scientific training and experience, and who is very familiar with apparatus of this particular character. He has also actually studied the defendants' apparatus and other similar apparatus *in operation* (R. 255). His testimony, however, need not be quoted at length here. After describing the construction and operation of the infringing apparatus, and two modes of operating it (*i. e.*, by turning on the top or the bottom air first), he concludes (R. 255-6):

> "If this mode of operation, either one of them which I have outlined, is carried on, then the apparatus, in my opinion, will operate exactly the same as the device of the McMichael patent in suit; * * * *the whole operation being due to the pressure of the air and in no way due to its velocity or kinetic effect.*"

He then describes the operation of defendants' apparatus without the top air inlet pipe and concludes (R. 257):

> "The operation without the top inlet to the top of the receiver, in my opinion, *is identically the same, for all practical purposes, as with it connected*, because the air admitted to the point E in this photograph immediately blows up through the concrete in the receiver and continues to do so until the resistance to the upward flow is equal to the resistance to flow out through the discharge pipe."

If now we compare the defendants' apparatus in this case with the defendants' apparatus in the *Ulen* case

(Exhibits 2 and C, Ulen R. 181 and 195), it will be seen that *the present apparatus is more clearly an embodiment of the patented invention than was the earlier infringing apparatus.* In the Ulen apparatus the vessel was disposed horizontally, not vertically as in the patent in suit and in the present apparatus, and the materials instead of gravitating to the discharge outlet were pushed by a plunger (H) to the outlet. The compressed air inlet pipe (A) at the outlet in that apparatus was disposed at a different angle to the line of discharge and was not directly pointed toward the outlet. The Court, however, in that case held the defendants' apparatus to be a full embodiment of the patent invention.

In the *Ulen* case the defendant contended that there was no infringement because of the structural differences in detail, *and raised the same contention here raised* by the present appellants, saying that there was "no suggestion of the cutting off of a segment of the mass of concrete as referred to in the opinion of the Trial Judge" and further contending that:

> "Apparently the operation is to create a great disturbance in the mass of concrete so as to be carried by the air in this segregated condition through the exit conduit."

The same defense of non-infringement is therefore urged here as in the *Ulen* case, but on a structure which is more clearly that of the patent in suit than the Ulen structure.

Disposing of this contention his Honor, Judge A. N. HAND—after referring to the new alleged prior use in the present case—said (Opinion, R. 327):

> "Aside from this new proof *the defendants rely on the old contention made in the earlier case that*

their device is purely kinetic. I do not regard it as theoretically probable that masses of concrete containing gravel stones of a diameter running to one and a half inches can be blown long distances by compressed air and I think the testimony of Mr. Ray that he could detect the passage of a series of slugs when he put his ear to the outlet pipe is the more probable testimony. Moreover, if air were floating the concrete it would be bound to pass through the pipe and *the pressure would be so rapidly reduced that the heavier portions would be left in the pipe.*"

The claim of petitioners that they did not use the top air inlet pipe after the first few months and disconnected it several months before the trial, more than three years later, is unsupported by satisfactory evidence.

The defendants' managing officer, Kennedy, and his brother-in-law and operating foreman, Swartz, are the only witnesses for defendants as to the alleged non-user of the top air pipe and the disconnecting of it finally, prior to the time of the trial of the suit.

The trial was postponed from June until October, 1926, on account of the granting of a motion by the defendants for leave to set up a new alleged prior use defense (R. 10), and, as we have seen, the machine *was in its original condition and was actually operated exactly as the patent specifies* as late as May 10th, 1926. This is admitted by the answer of the defendants to plaintiff's interrogatories *on that date* to the effect that its construction and operation were as described in the Engineering News-Record article of 1925, which shows the apparatus with top and bottom air inlets (Exhibit 3, R. 381), and states that:

"Essentially the gun, *as shown by Fig. 12* (Exhibit 3) is a conical drum with charging and discharging

> connections and with valves and air connections. When charged with concrete the proper *valves* are operated, air is turned on and the batch is *forced out of the drum* and driven through the discharge pipe line to the point of deposit" (R. 17).

It will be noted that this description says that the proper valves (not valve) are operated, and that the batch is *forced out* of the drum. The photograph, while it is not very clear on this point, shows the operator Swartz with *one hand* on the lever of the *bottom* air valve and *the other* on the *top* air valve to admit air to the top as well as the bottom. Mr. Swartz does not *think* that he had his hand on the top valve lever when the picture was taken (Qs87 and 88, R. 236), but it will be noted that the valve stem is immediately beneath his left hand, and that neither the hand nor the arm is resting against anything else. He posed for this picture not later than the fall of 1924, to show how the machine was operated (*id.*, Qs89-91), and after they had been using the machine for nearly two years. This is sufficient *to cast serious doubt, at least,* on the statements of these two very interested witnesses that they used the top air pipe for only three or four months.

Furthermore, the defendant Fleck, who installed and set up the apparatus, does not claim that the top air pipe was not in use right along (R. 23-26, Qs15-18, 29-41).

Again Mr. Kennedy says that the top air pipe was "full of concrete" (XQs192 and 195, R. 224), but Swartz testifies that this pipe with its valve, after it was disconnected, was left on and *used as a relief valve* (Qs15 and 16, R. 231, and RDQ97, R. 237). It also had the gauge (57) on it which indicated the pressure in the top of the tank behind the mass (R. 233). Therefore, *it was not plugged*

up, and Mr. Kennedy's statement that it was, appears to be merely a matter of expediency.

Another indication of the unreliable character of the testimony of defendants' managing officer Kennedy and foreman Swartz, is found in the testimony of these witnesses concerning the length of time that the defendants' machine was actually operated with the top air inlet in use. Both the magazine articles published on behalf of the defendants in 1925, more than two years after the infringement started, *show and describe this top air inlet in use*, Mr. Kennedy says that its presence "was a matter of neglect" (Q40, R. 206), after previously stating that he does not think it "stayed on there more than three months after we started" (Q34, R. 205), and then admitting that it was not taken off at least until the spring of 1926, or at some later time which he is unable to state (Qs42 and 83, R. 206, 212). He also says that they "cut it off" when they started to use liquid concrete (Qs32 and 33, R. 205), but this is shown to be untrue by his testimony that they never used anything but "liquid" concrete except for about "fifteen minutes" when they started at the end of 1922 (Q23, R. 203, and XQs126 and 132, R. 218-9).

He tries to attribute their trouble with the so-called dry concrete to the top air valve, but it is obvious that they wanted to use wet concrete—as all contractors do—and succeeded at the beginning in getting permission to "use a little more water" (XQ147, R. 220). The trouble at the start was evidently due to their admitted ignorance of the machine and its operation (Q10, R. 201), and the immediate shift to concrete with more water in it to the labor-saving effected by the elimination of tamping or ramming of the concrete. Mr. Kennedy says that the permission to use "wet" concrete was a verbal arrangement with the inspector (XQ149, R. 220), although they

were working under a written specification (Exhibit 19, R. 295) which called for "rammed" concrete, which, of course, means a "dry" consistency (*id.*, R. 296). He also pretends to forget all about the quantity of concrete placed in the tunnel and declines to say whether it was 3,000, 6,000 or 66,000 yards (R. 215-17), although their pay was measured by this yardage at as high as $19.00 per yard (Exhibit 19, R. 295).

Mr. Swartz is also indefinite about when they discontinued the use of the top air inlet, but, like Kennedy, admits that they did use it for some time (R. 230-1). He says it was a few days after he started to work, which was in April, 1923, after the machine had been in use for about four months. He also says that the top was actually disconnected "*I think* last April. April, 1926" (R. 232). But, like Kennedy, is not at all certain as to this.

Again Mr. Kennedy attributes the plugging up of the apparatus at the test made during the trial to the alleged failure of the operator to wash it out the night before (R. 224, 7-9). This, no doubt, was to forestall any inference that the plugging was due to an attempt to operate the apparatus abnormally and with material which was not concrete but mostly water. He even goes so far as to say that he would discharge any man who neglected to wash it out (R. 229). It is significant that although the apparatus was operated at the trial test by his best operator (Q227, R. 229) and was not washed out after that operation (Ray, Qs44-47, R. 267) nothing happened to that operator. Clearly, Mr. Kennedy's statement is a statement of something *entirely beyond his knowledge*, and shows his carelessness when testifying to facts which cannot be disproved. Nor was any operator or engineer who was on the job, except Swartz, his brother-in-law

(R. 237), called to corroborate him. And on this point Swartz was not asked to corroborate.

Another indication of defendants' eagerness to bring in conclusions not warranted by the facts is Mr. Kennedy's claim that kinetic action is shown by the fact that the discharge conduit pipes were worn evenly on all sides but soon wore out at the bends (R. 208 and 210). These pipes had been disconnected and reassembled, and inevitably turned around, several times (R. 215), and it is obvious that wearing out at the bends or elbows is caused by the slugs of concrete striking these bends in changing their course through the pipe.

The evidence of defendants' witnesses on these matters is therefore not frank, to say the least; and that the Court placed no dependence upon it is evident from the brief attention paid to it in the opinion.

But at some time between May, 1926, and the trial in October, 1926, the air connection to the top inlet pipe was removed, and at the trial, when the work was nearly finished and the arches—the important part of the tunnel —were all in (Swartz, XQ74, R. 235), the apparatus was operated under the direction of the Court (R. 209) and at the plaintiff's request, with the top air inlet pipe disconnected from the compressed air supply.

It must be assumed therefore that for more than three years and until one and a half years after the commencement of the suit, at least, the machine was complete in its embodiment of *all* the features of the patent in suit, *including the top air pipe,* and that there is no credible evidence that it was not *used exactly* as the patent in suit describes.

But whether the machine was ever practically used without the top inlet is immaterial, since it operated in the same manner and produced the same result and clearly embodied at least five of the nine process and apparatus claims of the patent without this top air pipe.

On this point his Honor, Judge A. N. HAND, in his opinion says (R. 327):

> "All of the claims were infringed until the Powers-Kennedy structure was impaired in the hope of avoiding infringement. After ceasing to introduce pressure behind the mass of concrete by means of closing the upper valve, it is true that some of the claims are not met, yet some of them are. There is undoubtedly a pressure behind the mass in defendants' machine far greater than ordinary air pressure and varying according to the freedom with which the air in the outlet tube is passing through it. As each slug was discharged, the pressure in the discharge pipe would lessen and the pressure behind the mass amounting to something like thirty pounds would force a further slug into the outlet. If this were not so, the high pressure through the discharge pipe would hold back the concrete."

It is also well settled that infringement is not avoided by making one element of a patented structure perform the functions of two if the same result is obtained.

Bundy Mfg. Co. v. *Detroit Co.* (C. C. A. 6th), 94 Fed. 524, 538;

(Citing *Winans* v. *Denmead*, 15 How. 330-342 and numerous other authorities);

Nathan v. *Howard* (*Id.*), 143 Fed. 889, 893;

Lawson Co. v. *G. G. Atlas Systems* (C. C. A. 2nd), 14 Fed. (2nd) 22, 23.

The testimony on the question whether the defendants' changed apparatus actually operated in the manner specified in the patent, can hardly be regarded as conflicting since **all the witnesses on both sides admit that there was substantial top air pressure.**

Thus, defendants' expert, Mr. Dyer, says (R. 245):

> "That *air pressure above the mass* necessarily is always lower than the pressure below, because in addition to the weight of the concrete opposing the air as it flows out, we have the resistance to the passage of the air by reason of the material itself. So that *the pressure above is always considerably less than the pressure below.*"

Plaintiff's expert Mr. Ray says that the operation without the top air inlet is

> "identically the same for all practical purposes, as with it connected, because the air admitted to the point E [outlet] in this photograph immediately blows up through the concrete in the receiver' * * * until the two pressures equalize (R. 257).

And again (*id.*):

> "But when a large—or a pressure of a few pounds builds up at the bottom due to the slugs sticking a little bit at some point, or due to numerous slugs building up on the way out, the additional pressure will cause the air to flow up to the top of the receiver, so that I think it can be safely said that the pressure at the top of the receiver *is substantially the same* as the pressure at the point of discharge E."

Even Mr. Kennedy admits that there is top air pressure behind the mass. He says (Q81, R. 212):

> "Well, there is always some that would come up through the mass of concrete that is in the blower. It works up from the bottom."

Mr. Ray states positively that when the air was turned on from the main line at 65 to 75 pounds this main line pressure dropped to 40 or 45 pounds (R. 256):

> "Immediately, when the throttle valve K was opened, the air in this line dropped to about 45 pounds or something like that, 40 or 45 pounds, in that neighborhood.
>
> "The gauge on the receiver, on the top of the receiver, indicated some pressure, that is the particular guage that was being used on the machine. It was impossible, however, to show what this pressure was, so a new gauge was brought up by Mr. Kirkland which was later attached to the machine at this point and this gauge would jump up to about 30 pounds immediately that the throttle valve K was opened."

In this he is fully corroborated by Mr. Kirkland, who witnessed the tests with defendants' apparatus (R. 276).

Even defendants' operating foreman Swartz admits that the pressure at the top of the tank and behind the mass jumped from zero to "about 30 pounds when the concrete was going out," while the gauge on the main air line registered from 45 down to 32 pounds (Qs48 to 51, R. 233). On cross examination he says (R. 235):

> "XQ61. And then as soon as the air was turned onto the machine, it shot up to about, you say, 30 pounds? A. 30 pounds."

When we consider that 30 pounds per square inch on the surface of a mass of concrete 60 inches in diameter (see Exhibit 5, R. 383) *will give a total pressure of approximately 85,000 pounds* (60 x 3.14 x 15 x 30 = 84,780), it will be seen that the pressure behind the mass in the defendants' apparatus at 30 pounds per square inch was enormous, and more than ample to compact the mass, force it in a solid body into the outlet and present it to the bottom jet in this condition to be cut off and shot through the conveying pipe in slugs or sub-masses exactly as the patent describes.

This is the meaning of the patent where it says (p. 2, lines 53, 70, 88, etc.):

> "the rapidly moving air from the pipe 10 acts upon said masses successively of the general mass, at points near those where they enter the delivery pipe"

and where, in such claims as Claim 17, it says:

> "means for causing a jet of air to impinge upon successive portions of the mass in the general direction of the discharge duct."

That the defendants' apparatus even when the top air pipe was disconnected operated as a pressure apparatus, compressing the mass and cutting off and conveying "successive sub-masses," and not as a kinetic device floating the materials while in suspension, is thus well established.

His Honor, Judge A. N. HAND, dismisses the petitioners' contentions on the prior kinetic patents in view of this with scant consideration. He says (R. 328):

> "As for the point raised that patents for kinetic devices are pertinent prior art, it is answered by the fact that neither the patent in suit nor the defendants' device are kinetic in operation."

This pressure, as distinguished from kinetic, operation of defendants' apparatus is not only established by the evidence, but is established beyond all question by the physics of the case.

The evidence on this point may be summed up as follows:

1. *The nature and weight of concrete is such that it could not be conveyed by the kinetic or floating action of air.*

Concrete weighs about 150 pounds per cubic foot or over 2 tons per cubic yard (Ray, Q96, R. 275), and consists of a mass of rock or coarse gravel, in this case only small enough to pass through a one and one-half inch ring (Kennedy, Q36, R. 205), with a smaller quantity of sand and cement. *The bulk of the concrete is rock.* When we consider that this rock has from 1600 to 2400 times the weight of air (Ray, Q99, R. 276), it will be apparent that to say tons of it are *floated* by air, distances up to 1160 feet—in this case—to elevations of 67 feet, and around numerous 90° bends (R. 203), *is to state a manifest absurdity.* It is no wonder that the Trial Court refused to believe it possible (Opinion, R. 327).

Mr. Dyer, defendants' expert, gives it as his opinion that the concrete is floated, but his opinion is not that of an engineer (Q58, R. 252) or of a man with actual experience in this art (*id.*), and he even entertains the notion that air is .1 or .01 of the weight of water instead of .0012 or about 1/800th the weight of water, which is the fact (R. 251). If air were really 80 or even eight times as heavy as it is, it would, of course, act in a different manner.

The Court of Appeals affirming the Trial Court on this point said (R. 346):

> "On the other hand, it is difficult to believe that particles of the mixture, including stones of an inch and half in diameter, are floated independently in the air, as sand or grain is blown. *Ray's testimony regarding the stones effectively disposes of that possibility under any such pressures as are used.* It would seem to us that the mass as a whole must block the passage of air, forming an obstruction which yields at different points, because of its uneven power of resistance, and that the heavier stones must be carried by the impact and momentum and cohesion of the lighter substances, the whole mass going forward in a constantly agitated mixed stream, just as McMichael describes."

They also find that regardless of the nature of the movement of the materials, the patent is infringed using the following language (R. 346-7):

> "Moreover, several of the claims in suit are for the apparatus, or machine, and if they are infringed it is enough for the purposes of this suit, whether the machine discharges its concrete kinetically or in successive slugs."
>
> . . . . . .
>
> "But whether the concrete goes forward as we imagine, or in some other manner, *there is no sufficient reason to suppose that defendants' machine does not operate in the same manner as plaintiff's, whatever that manner may be.*"

2. *If the concrete were conveyed in a floating condition by the air as defendants contend, the air would blow through it and the pressure would drop to almost nothing.*

The Trial Court noted this self-evident proposition saying (Opinion, R. 327):

> "Moreover, if air were floating the concrete it would be bound to pass through the pipe and the pressure would be so rapidly reduced that the heavier portions would be left in the pipe" (see also Ray, R. 261).

3. *If the concrete were floated it would first have to be broken up, and the careful intimate mixture required by the specifications of defendants' contract destroyed.*

This is also self-evident, and shows how impossible the thing is. Imagine the Board of Transportation carefully specifying a thorough and intimate mixture of the fine and coarse aggregates in a concrete mixer which must be rotated at least "one minute" to insure that mixture (R. 295-6) and then permitting the contractor to *blow it to pieces* and disintegrate it between the mixer and the subway walls. Of course, the inflation of the mixture by a blast of air would blow out the sand and cement and leave the rocks comparatively bare (R. 261-2).

4. *If the concrete were floated or carried in a blast of air at the rate of 100 feet per second, as both sides agree* (see Ray, R. 260), *the water and fine particles would be delivered in the form of a spray.*

In other words, the water and the powdered cement would be "*atomized*," and would escape in the atmosphere leaving the concrete mixture without these vital elements, so that we would have "concrete" without cement, and, therefore, *no concrete at all.*

But no such action, of course, takes place. Even Mr. Kennedy admits that the concrete came out "*solid.*" He calls it a liquid—which it was not—but nevertheless says that this liquid came out solid and that there were no air

bubbles in it. This is also the testimony of the other witnesses.

Mr. Kennedy says (R. 224) that when the concrete comes out of defendants' apparatus "*it is like wet concrete,* surely, stones, sand and cement" (XQ186), and

> "XQ187. It is quiet? A. Oh, yes, a liquid *mass.*
> "XQ188. Bubbles would make honeycomb, and we do not allow the air to get in the concrete where it is placed."

And, finally:

> "XQ189. When the concrete is *discharged* it is *solid?* A. It is.
> "XQ190. It is solid? A. Oh, yes, there is no question about it."

Realizing that he had unwittingly admitted that the conveyance and discharge of concrete was not—and could not be—due to kinetic or floating action, which would, of course, separate the aggregates and mix air with the whole mass, he, on recall after adjournment (R. 242-3), says that his foregoing answers are "ambiguous" and explains that:

> "A. The concrete as discharged from the pipe is in a *liquid* condition. When it goes into the form it is in a *liquid* condition. It solidifies in the form" (Q230).

Thus again admitting, while attempting to explain, that *it is not broken up or mixed with air.* Whether it be called a liquid, a solid or a semi-solid, the fact that it is not broken up or disintegrated shows that it is not conveyed kinetically but *in a mass.* Mr. Kennedy calls it "a liquid mass" with no air in it, and this seems to settle the point.

Of course, it is an exaggeration to call the wettest concrete "liquid," since the bulk of it is rock and the other aggregates are solids, except the very small quantity of water. If the mixture were really liquid it could not be placed in the side and overhead forms of the tunnel arch but *would run out.*

Nor do defendants' photographs (Exhibits L, M and N) show anything to support the flotation theory. They are flash-lights, with the camera shutter open (R. 248), of material moving at 100 feet per second and *show nothing of the material but a blur* (Ray, Qs29-30, R. 262).

Even the tests made by defendants during the trial prove that there was no kinetic or air floating action in defendants' machine, but positive pressure action conveying the material.

These tests were made at the direction of the Court at the Queensboro Subway in 41st Street, where the machines were located, the work of placing the concrete arches of the tunnel being completed (Swartz, XQ74, R. 235), and the machine tested being in use to fill in outside the water-proofed subway wall (Kennedy, Qs217-8, R. 227). The machine was operated by the defendants' chief operator Swartz and the operation was witnessed by counsel, by Messrs. Swartz and Kennedy and others for defendants, and by Mr. Ray, plaintiff's expert, Mr. Kirkland and Mr. Fitzgerald, a skilled operator, for the plaintiff.

The machine was down in the excavation, about 55 feet below the point of discharge at the street level, and the pipe from the machine up to the point of discharge had in it eight 90° bends and two 45° bends (Kennedy, XQs203-208, R. 226).

The "concrete" used was not a real concrete mixture at all (Ray, Q14, R. 259, XQ75, R. 270; Fitzgerald, Qs5-9, R. 280; Kirkland, R. 276).

The pressure employed on the test was very low, and the volume evidently inadequate, because the pressure dropped to 40 or 45 pounds in the main air line as soon as the air was turned on (Ray, R. 256, Swartz, Q50, R. 234). The top air pipe was disconnected.

Nevertheless the machine operated as a *pressure, mass discharging* device, and in the following manner:

A. As soon as the air pressure was turned on, the pressure in the top of the vessel and behind the mass immediately jumped from zero to about 30 pounds (Ray, R. 256 and 339, Swartz, Qs49, 60, 61, R. 234-5). This demonstrated that although the top air pipe was disconnected air pressure behind the mass was instantly established, the total pressure, on the top surface of the mass, at 30 pounds, being *as high as 42 tons.*

This pressure behind the mass is substantially the same as the bottom pressure. In other words, there is a balance between the pressure behind the mass and the pressure at the outlet (Ray, R. 257 and Q12, 259). As Judge HAND says in his opinion (R. 328):

> "If this were not so, the high pressure through the discharge pipe would hold back the concrete."

B. The mixture was packed and forced by this pressure through the contracted outlet where it was cut off and conveyed in *slugs* by air *pressure* at a rate approximating 100 feet per second through the conveying conduit with its ten elbows and to the point of discharge 55 feet above the apparatus (Ray, R. 256, Kirkland, R. 276).

This was carefully and thoroughly observed by Mr. Ray who says (R. 256):

> "I observed the operation in all ways that I could by listening to the concrete passing through the pipe, discharge pipe J, about 50 or 60 feet from the receiver, placing my ear to it and by observing it coming out of the pipe. I noted distinctly the passage of slugs through the discharge pipe J.
>
> "In one particular instance I had my ear against the pipe and the whole pipe made such a jump as the slug passed by, that it startled me and I jumped up. I heard smaller slugs distinctly going through."

In this he is fully corroborated by Mr. Kirkland (R. 276) and Mr. Fitzgerald (R. 280) and their testimony was accepted by the Court.

These practical tests and observations were accepted by the Trial Court as establishing the full realization of the invention and its operation as contended. Judge A. N. HAND in his opinion (R. 327) says:

> "I do not regard it as theoretically probable that masses of concrete containing gravel stones of a diameter running to one and a half inches can be blown long distances by compressed air, and I think the testimony of Mr. Ray that he could detect the passage of a series of slugs when he put his ear to the outlet pipe is the more probable testimony."

This amounts to a conclusive finding of fact on this point, although slug or sub-mass movement of the concrete is not essential to infringement.

C. There was no material separation of the stone, sand, cement and water, but this was delivered at the discharge end of the conduit *substantially intact* (Ray,

Qs25 and 27, R. 261, XQ72, R. 270 and Fitzgerald, Qs18 and 19, R. 280). This demonstrates that there was no kinetic action or carrying of the materials in an air current, but a conveyance of *the complete mixture in "submasses" without separation.* Further evidence of this is found in the fact that the slugs moved faster at the discharge end than near the other end, which shows that they accumulated velocity (Ray, Q19, R. 260) due to the maintenance of the air pressure held behind them (*id.* Q23).

When the defendants first attempted to discharge materials in the apparatus it failed, and the pipe plugged up, and an hour or more was required to clear it and put it in operating condition again (Ray, Q26, R. 261, Kennedy, XQs181-3, R. 224). The cause of this does not appear, nor how the apparatus was operated to produce it. It appeared at the outlet that this was an attempt merely to clean out the machine (Ray, Q26 and XQ69, R. 261 and 270).

The defendants' machine therefore with the top air pipe disconnected, with inadequate pressure and a mixture which was not really concrete operated in the manner specified in the patent and realized the invention.

This was not disputed by defendants' witnesses, except Mr. Kennedy, who nevertheless admitted that the concrete came out *as mixed concrete without air separating it,* and Mr. Johnson, defendants' counsel who took the stand in an attempt to dispute the testimony of plaintiff's witnesses and testified that the materials came out separated (R. 277).

Mr. Johnson's observations, however, were evidently faulty, for he says that the time required for the discharge of an entire batch of concrete was "a few seconds" (XQs3, 6 and 7). Then "from 5 to 20 seconds or maybe 25 sec-

onds" (Q10). It actually took more than a minute (Fitzgerald, Q10, R. 280), and this was the time it took for the discharge of a batch when Mr. Dyer witnessed it as defendants' expert (R. 246).

Mr. Johnson's bias is shown by his telling Mr. Fitzgerald, whom he evidently took to be one of the defendants' workmen, to "keep quiet" when the latter said that the mixture was "very unusual" (R. 280).

The testimony of Mr. Fitzgerald, who is a skilled and experienced operator of apparatus of this kind with a thorough knowledge of concrete, corroborating Mr. Ray and Mr. Kirkland, was therefore substantially undisputed. He says (R. 280):

> "Q18. Mr. Fitzgerald, how did the concrete come out of that machine on October 7th, at the discharge pipe? A. It came out in sections. I would say, first came in sections of concrete, then air, and then sections of concrete.
>
> "Q19. Was the concrete separated? A. No, sir."

And his testimony as a practical expert that the mixture used was not a proper concrete mixture (Qs5-9), which is not disputed, but is corroborated by Ray and Kirkland, shows how unreliable the defendants' testimony is, and indicates why no weight was attached to it—such as it was—by the Court.

The finding of the Court, after hearing the witnesses and judging the weight and credibility of their testimony, that defendants' device operated in the manner set forth in the patent (Op. R. 327), *is conclusive.*

> *Adams* v. *Gilliland*, 242 U. S. 350;
> *Blettner* v. *Gill*, 251 Fed. 81.

An infringer cannot escape liability by impairing the apparatus or processes covered by the patent.

This doctrine is so well settled that it hardly needs quotation from any authority to support it. Perhaps the best known cases are the following:

Sewing Mach. Co. v. *Frame*, 24 Fed. 596;
Penfield v. *Chambers* (C. C. A. 6th), 92 Fed. 630, 653;
King Ax Co. v. *Hubbard* (C. C. A. 6th), 97 Fed. 795, 803;
Nathan, et al. v. *Howard*, 143 Fed. 889, 893;
National Binding Mach. Co. v. *McLaurin* (S. D. N. Y.), 186 Fed. 992, 996;
Manton Gaulin Co. v. *Dairy Co.* (D. Con.), 238 Fed. 210, 215; affirmed (C. C. A. 2nd) 247 Fed. 317.

In *King* v. *Hubbard* (*supra*), Judge TAFT, writing the opinion of the Court, said:

> "This is an instance, not infrequent in patent litigation, where the infringer has sought to evade the claims of a patent, the substance of which he is appropriating, by deliberately impairing the function of one element, without destroying the substantial identity of structure, operation and result" (citing authorities).

The doctrine was directly endorsed by the Appellate Court in *Elyria Iron and Steel Co.* v. *Mohegan Tube Co.*, 7 Fed. (2nd), 827, 831, though the Court was divided on the actual facts. In that case his Honor, Judge HOUGH, said:

> "* * * and impairing or badly applying a method will not avoid infringement of a patent therefor."

Following these authorities his Honor, Judge A. N. HAND, in the present case (R. 327) said:

> "All of the claims were infringed until the Powers-Kennedy structure was *impaired in the hope of avoiding infringement.* After ceasing to introduce pressure behind the mass of concrete by means of closing the upper valve, it is true that some of the claims are not met, yet some of them are."

And the Court of Appeals affirms this finding in the following language (R. 348):

> "Mr. Ray, plaintiff's expert, testified that, because of this, the operation without the top air inlet is identically the same for all practical purposes as with the top inlet. While the claims which specify an upper air inlet (*e. g.*, claims 2, 17, 34 and 35) might not be infringed by a machine which omits it, the other claims in suit make no reference to the upper air inlet. We think there is clearly infringement of claims 4, 6, 21, 22 and 28."

The claims possibly not met are presumably the four structural claims (2, 17, 34 and 35) which expressly include an air inlet pipe or the like at the top of the vessel. The remaining five claims do not specify such an inlet but leave it to the operator working under the disclosure of the patent to provide pressure behind the mass to compact it and force it down into the outlet *in any suitable manner. Nevertheless, even these four specific claims for the structure were infringed until the top air pipe was actually disconnected shortly before the trial.*

But the question whether all the claims are met by this impaired apparatus instead of five of the nine in suit *is academic* and was evidently so considered by the Trial Court and the Court of Appeals.

The teachings of the patent specification leave one employing the invention such latitude as the defendant has exercised in practicing the invention. It says (p. 2, line 80, *et seq.*):

> "One of the strongly marked and novel matters incident to this provision of the pipe 10 for introducing air directly into the discharge pipe, whether considered *by itself* or considered as *supplemental* to the agency *such as* the air from pipe 8 tending to effect downward and forward propulsion of the entire mass, is this, that the rapidly moving air from pipe 10 acts upon sub-masses, successively of the general mass, at points near those where they enter the delivery pipe."

Again it states (p. 1, line 55):

> "The air inlet into the chamber being *preferably* near the top thereof."

Again (p. 1, line 86, *et seq.*):

> "The instant the air is turned into the chamber the door for the closure will be firmly held in closed position by the air pressure."

And again (p. 2, line 68, *et seq.*):

> "Air from the lower pipe 10 may force itself into the body of the mass, and the relatively small air jet acting upon the relatively large stream of outward moving materials directly engages with the sub-masses to push them along."

The defendants, therefore, did not have to go outside the specification of the patent to learn that they could utilize the lower jet to supply air pressure behind the mass as well as at the outlet, and thus perform the functions of the patented invention and embody its claims.

THE SLUG THEORY.

The Courts in the Second Circuit have held that regardless of how the concrete is discharged and conveyed, the petitioner has infringed by using the patented apparatus and method, and producing the same result.

They have also held that the patent is not limited to the slug theory of operation, saying (Opinion App't Court, R. 346):

> "To us the dispute seems irrelevant. The patent says nothing which commits the patentee to the slug method of operation."

Nor has the respondent ever contended that the slug method of operation was essential to infringement. Obviously it is not. Nevertheless, it is believed that by this method, substantially, and by it only, can the patented apparatus operate to produce its truly remarkable results. We, therefore, will outline the slug theory, as follows:

1. When the heavy, rocky, non-fluent mass of concrete is placed under pressure behind it in the chamber, it is compacted and jammed into the restricted outlet of the chamber.

2. It might be forced by this top pressure alone a short distance, through a discharge pipe, but even then it would be likely to form an "arch" in the restricted outlet, because the stones which constitute the major part of the mixture are substantially in contact with each other—the sand and cement filling the spaces between them—and will brace against one another to form an arch or dam as they are crowded into this neck.

It is for this reason that the bottom jet is sometimes referred to as the "*arch breaking nozzle.*" The nozzle, however, does not really *break* the arch in its normal operation, but *prevents the formation* of it, and insures a continuous outflow of the concrete by injecting a velocity jet into the material at this point.

3. But concrete certainly cannot be discharged and transported to any considerable distance—as all tunnel lining operations require—by pressure behind the mass alone. For short distances—up to say 30 feet—ordinary chutes, or buckets running on a boom, can be used, without the necessity of bringing in air pressure apparatus. Nor can concrete be forced around bends in the pipe, and up to such elevations as are commonly met with, by pressure behind it alone.

4. A half yard of concrete weighs a ton, and the resistance due to the friction between it and the pipe probably necessitates a much greater additional force than that required to overcome its weight.

5. Therefore, it is obvious that ordinary air pressure (the petitioners used as low as thirty pounds) cannot move a half yard column of concrete, nor even a quarter yard. The pressure required would amount to *tons*, and a half yard of concrete will fill an eight-inch pipe for approximately forty feet. *The resistance, therefore, is enormous.*

6. Something, therefore, must be done *to break up this column* and reduce it to sections. But the concrete cannot be floated; that is physically impossible. Moreover, a jet of air from a two-inch pipe at as much as one hundred pounds pressure, expanding into an eight-inch pipe, would be reduced to almost nothing—possibly seven

pounds. Therefore, the pressure must be held or "pocketed."

7. It, therefore, seems obvious that the only way to break up the heavy column and preserve the pressure behind it, is to separate that column into slugs or small plugs. Now, in accomplishing this the patented apparatus operates in the following manner:

> a. The jet of compressed air from the nozzle penetrates the small portion of the mass packed in the outlet by the top pressure, and *cuts it off*, shooting it through the outlet and along the conveying conduit, as a ball of putty or other slug is shot through a blow-pipe.
>
> b. As soon as this slug moves the air issuing from the nozzle *expands* and the pressure there *is momentarily reduced.*
>
> c. This instantly causes another section of the mass to jam into the outlet, under the pressure behind it, which is constant or "static."
>
> d. This section or plug partly blocks the nozzle and causes a rise in the nozzle pressure, so that the nozzle cuts it off and shoots it forward again.
>
> e. This operation of alternately cutting off and shooting a slug, and pressing another into the outlet is repeated and goes on—with lightning rapidity—until the entire mass in the chamber is discharged.

This is the only way in which the wonderful result of the patented method can be scientifically accounted for; and Mr. Ray, whose scientific qualifications and experience are of the very highest, as the respondents' expert has very clearly shown that such is the case (Q6, R. 255-8; Ulen R. 126-131), *after a careful study of the apparatus*

in operation. And in this he is fully corroborated by the other witnesses (Kirk, Ulen R. 54; Bateman, *id.* 119; Fitzgerald, R. 280).

The evidence of this action may be briefly summarized as follows:

1. The gauge on the compressed air pipe leading to the nozzle vibrates, showing rapid pulsations in the pressure at the nozzle;

2. The slugs can be heard and felt at a bend of the conveying conduit not far from the vessel;

3. Close observation at the discharge mouth of the conveying conduit shows pulsations of the material, indicating that it is not being discharged in a solid stream, but in sections succeeding one another with such rapidity that they are hardly visible to the naked eye;

4. The discharge of the slugs is accompanied by rapid booming sounds, indicating the rapid escape of air pockets.

As the concrete is discharged at approximately a speed of 100 feet per second, even a camera with a shutter set at one one-hundredth of a second will show a blur. *The petitioners' flash-light photograph (Exhibit N), taken with an open camera shutter, therefore means nothing.*

When we consider that if the slugs are an average of one foot in length, they are discharged at a rate of more than *ten per second,* it is no wonder that the eye of the camera and the eye of the untrained observer records a continuous stream of material mixed with air, as Judge BOURQUIN believed. **But, as we have seen, whether this theory is correct or not, the petitioners have used the patented apparatus according to the patented method, and have, therefore, infringed the patent.**

THE TESTS IN THE STORRIE CASE.

These tests, although they led to the finding of the Court that there was no slug action, are not such a basis for a finding as makes it conclusive. The conclusion is based largely on certain recording instruments employed by the experts for the two parties to that suit, plaintiff's being pressure and mechanical, and defendant's electrical. It is submitted that the electrical device used by the defendants in the *Storrie* case is not a proper recording instrument. It merely recorded the variations in *conductivity* in the conveying conduit, while the concrete was passing through it, and these variations in conductivity depend primarily upon the variations in the wet portion of the mixture—sometimes called "soup"—more than on the presence or absence of slugs. If the records are properly interpreted, however, they do indicate the passage of slugs. *It is submitted that the passage of slugs can only be properly recorded by instruments for recording pressure and vibrations, such as were employed by the plaintiff.*

The finding of the lower Court in the *Storrie* case therefore that there was no slug action is not a conclusive finding of fact.

VII.

THE CONFLICTING DECISIONS.

The decisions in the Second Circuit are correct on the facts and the law and should be affirmed. The decision in the Ninth Circuit is based on an erroneous conception and interpretation of the patent and the prior art relating thereto. It also accepts as evidence of prior art, matters which are not evidence at all. It should therefore be reversed.

The decisions in the Second Circuit have been discussed fully in the foregoing portions of this brief. The decision in the Ninth Circuit in the *Storrie* case (No. 528 here), will be fully discussed in the petitioners' brief in that case, and such discussion, therefore, need not be repeated. The following brief summary will be sufficient for the purposes of this case:

1. Of the prior patents which were held to anticipate the McMichael patent in suit, the Kolsche German patent, 18,394 of 1882, is *distinctly for a flotation or kinetic apparatus,* and the two British patents to Duckham No. 4,400 of 1875 and No. 15,348 of 1885, are for *liquid column* propulsion.

As we have seen, under the "Prior Art" section of this brief, the Kolsche patent is for an apparatus intended solely to convey granular material, such as sand, by dropping it in a *small stream into a current of air,* disintegrating it and floating it along. It was not intended to be used and *could not be used* for the conveyance of concrete or any similar substance. If, by the use of any amount of pressure, concrete could be conveyed in it, the concrete *mixture* would be *destroyed* by complete *separation* of the light and heavy elements or aggregates.

This patent was pleaded by the petitioners in this case and by the defendants in the *Ulen* case, but was not considered of sufficient importance to be used in evidence.

2. The two Duckham British patents are for apparatus designed to be employed in dredging operations and to convey mud and other excavated material *in a column of water*, by placing pressure behind the column. The nozzles or jets referred to—but not shown or described—were merely "to keep the mud agitated" in the bottom of a huge tank of water, and could have none of the functions of the McMichael specifically located *jet at the outlet of the chamber*. Nor did they suggest any such a jet or any such a combination of pressure as that which is *indispensable* to the McMichael invention.

3. *All three of these patents lack the vital and essential nozzle at the outlet of the chamber* for injecting compressed air into the mass, and lack the essential *combination* of *pressure* behind the mass and at the front of the mass.

It must, therefore, be apparent that the District Court for the Western District of Washington, and the Circuit Court of Appeals for the Ninth Circuit, *failed to appreciate the true character of the McMichael invention*, because they assumed that it was in the same class as these prior irrelevant devices. The *difference* between McMichael and these prior patents is *the very essence* of the present invention, and in failing to realize this, the Courts in the Ninth Circuit failed to *understand* that invention. In other words, *they ignored the features of the present invention, without which it would not exist.* This is true of the particular *location* of McMichael's jet at the outlet. Unless he had understood the vital importance of that particular location—which Duckham never dreamed of—he never could have made the invention.

4. The acceptance of Leake's vague and uncertain deposition, without corroboration or any visible, tangible evidence whatsoever, as sufficient to establish a prior use, is against all the authorities, and is believed to be unique in the annals of patent litigation.

This is rendered more extraordinary by the fact that Leake, whose patent application was filed nearly nine months *after* McMichael's, permitted McMichael to receive the decision of priority over him in the Patent Office.

The fact that Leake's application was purchased by McMichael's attorney for a small consideration in December, 1910, and in 1917 assigned to the owner of the McMichael patent, proves nothing, particularly in view of the fact that the Leake patent purports to be *for improvements only* on the specific form of the McMichael apparatus, which McMichael's attorney, and later the owner of his patent, may have considered of some value, *in spite of the fact that McMichael was the prior inventor* and had obtained claims for the *broad* invention—*which Leake could not claim.*

The fact that McMichael's attorney owned the Leake application, if it means that McMichael or his assignees controlled that application, *does not even suggest that they regarded Leake as the prior inventor.* Rather it indicates that, controlling both applications, and being in a position to issue the broad patent on *either* application to themselves, they chose to issue the broad patent on the McMichael application *because McMichael was the prior inventor.*

Furthermore Leake, in his deposition, expressly admits that prior to McMichael's application *he did not use* the vital and essential jet at the outlet, or any equivalent thereof. The acceptance of *ex parte*, unverified, hearsay

statements by Leake's attorney as evidence that he did, does violence "to every Anglo-American legal concept" of evidence.

General Electric Co. v. *P. R. Mallory Co.* (C. C. A. 2nd), 298 Fed. 579, 585;

Spaldings v. *Wanamaker*, 256 Fed. 530, 167 C. C. A. 602.

McMichael is dead (Ulen R. Q96, p. 56), and these transactions to which he was a party in the Patent Office date back twenty-two years. To bring up now *ex parte, hearsay* statements of others made during the few years following his application, and use them against him, is not only against all precedent, but against all fairness and reason. (See *G. E. Co.* v. *Mallory.*)

5. Both the District Court and the Court of Appeals have criticized the enlargement of McMichael's specification, and the addition of new claims during the pendency of his application. *This he had full right to do.* He even had the right to adopt claims to the invention which originated in Leake's application, *and which were suggested to him by the Patent Office* for interference purposes (File W. R. Ulen R. 212). This is common practice in the Patent Office in interference proceedings. It was purely a matter *between McMichael and Leake* at most, and one which these infringers, who have appropriated the invention as patented, cannot take advantage of.

6. The courts in the Ninth Circuit appear to ignore entirely the fact that McMichael in 1912 filed a supplemental oath covering all the alleged new matter in his application (Ulen R. 241, 251-253).

But, as we have seen, amendments to an application

which are fairly within the original disclosure require no supplemental oath.

> *Westinghouse Co.* v. *Metropolitan Co.* (C. C. A. 2nd), 290 Fed. 661.

And an applicant has full right to better describe and claim his invention if during the pendency of the application he obtains a fuller or better understanding of it.

> *Cleveland Foundry Co.* v. *Detroit Co.*, C. C. A. 6, 131 Fed. 853, 857;
> *Diamond Rubber Co.* v. *Consolidated Tire Co.*, 220 U. S. 428, 435.

7. The courts in the Ninth Circuit apparently held non-infringement—at least partly—because the slug theory was considered untenable, and because they seemed to consider it a feature of the patent (Opinion, 27 Fed. [2nd] 838). As we have seen, the patent is committed in no way "to the slug method of operation," and the Court of Appeals in this case has so decided. The patent itself is conclusive evidence of this. Whether the theory is correct or not, as the Second Circuit Court of Appeals has said, is "*irrelevant.*"

8. The courts in the Ninth Circuit also erred in considering the test made *in camera* by the defendants of the alleged Smith 1872 apparatus, of importance, for the following reasons, among others:

a. The test was made without the presence of anyone representing the plaintiff.

b. It was made by interested witnesses who represented an infringer of the McMichael patent (*Concrete* v. *Storrie*, R. 469-71).

c. No definite identification of the materials used is given except that "the Smith formula mix

was used" (*Id.* 465), and this means a "*liquid*" or freely flowing fluid—*which is not concrete.*

d. The liquid material was blown a very short distance only, and not enough to duplicate ordinary working conditions in any sense.

e. The witnesses do not state directly that the operation was *successful* or that it demonstrated *the practical character* of the Smith apparatus but that it was sufficient to "*satisfy*" them (*Id.*). Interested and biased witnesses are too easily "satisfied" as to the operativeness of a device alleged to anticipate a patent *which they have infringed.*

But the Smith 1872 patent lacks the indispensable nozzle near the outlet of the McMichael patent, and whether it can be made to deliver a soup called "concrete" for a short distance under skilful handling or not is immaterial.

That the defendants in both cases chose to use the nozzle—and all the other features of the patent in suit—and infringe, rather than resort to such a thing as that shown in the Smith patent, is sufficient evidence that the differences constitute the difference between failure and success.

9. Nor does the case of *Concrete* v. *Gomery* (269 U. S. 177), in which the patent disclosed no new element, combination or result, apply to this case, as the Courts in the Ninth Circuit held. The best answer to this is found in the able and learned opinion of Judge SWAN for the Second Circuit Court of Appeals in this case (27 Fed. [2nd] 688, R. 343), to which the Court is referred.

Kirkland's Engineers Society Paper.

The theory of operation stated by Mr. Kirkland in his Engineers Society paper, written more than six years before this suit was commenced, and which was fully corrected by him in the *Ulen* suit long before the defendants (petitioners) called him as *their* witness in this case, *is not evidence of anything, except the obscure nature of the principle discovered by McMichael, and is entirely inadmissible.*

The following Court of Appeals cases, hereinbefore referred to, are cited as showing the exclusion by this Court of documents which gave far better excuse for their introduction by the defendant.

> *Spaulding* v. *Wanamaker*, 256 Fed. 530, 533;
> *General Electric Co.* v. *Mallory*, 298 Fed. 579, 586.

Furthermore it was expressly corrected and explained under oath by Mr. Kirkland in this suit and in the *Ulen* suit, *after he had actually made tests* and found that his theory of operation was *incorrect*. It is also shown to be clearly erroneous by thorough tests with appellants' and appellee's and other apparatus and the testimony of witnesses concerning the same. Apparently the appellants' contention is that a theoretical, unauthorized and unsworn statement by Mr. Kirkland must be correct because he afterwards and now, after thorough test and scientific investigation, *swears* that it is *incorrect*.

The assertion that this is "testimony" is based solely on this paper describing Mr. Kirkland's *theory* of operation which was read before a meeting of engineers, more than *six years* prior to the commencement of this suit, and while he was connected with another concern than the plaintiff—the *Placing* company—which was a mere licensee, and while he did not represent the plaintiff or the patent owners directly or indirectly in any way (R.

104). Furthermore, Mr. Kirkland was *not* plaintiff's witness but *defendants'*, and while on the stand as defendants' witness *repudiated* any statement or inference in his article tending to controvert the statements of the patent or the testimony of respondents' witnesses that the apparatus of the patent is a *pressure apparatus* and *not* a kinetic apparatus (R. 105-6). His testimony in the *Ulen* suit a year and a half before he was called by the defendants in this suit was very fully and clearly to the effect that it is a *pressure* and *not* a kinetic apparatus (Ulen R. 47-49).

Nor did Mr. Kirkland in this article state that the patented apparatus was ever used—kinetically or otherwise—to place *dry* materials, as petitioners' brief implies, although it would be entirely immaterial. He said that it was used to place *and pack* limestone screenings and sand—which obviously must have been *wet*—in back of a concrete tunnel lining. That the stuff was *dry* or was *floated* is neither expressed nor implied.

But the entire article is worthless as evidence, and would be worthless if it had not been corrected by the witness.

It was ignored by both the Trial Court and the Court of Appeals—for the obvious reason that it was not evidence, and would have been worthless if admissible as such.

Theories of operation stated by a witness prior to his testimony in the suit *are not evidence at all.*

> *Marconi* v. *DeForest* (C. C. A. 2nd), 243 Fed. 560, 562.

The only value such a thing could have would be to show that McMichael's discovery was so obscured that an engineer who had seen his apparatus working was unable to solve its method of operation.

The Decisions in the *Concrete Appliances* v. *Gomery* Cases Clearly Support the Decision of the Courts in the Second Circuit in This Case.

In the decision of the Court of Appeals for the 6th Circuit, the patent was held valid because the prior devices *were not intended to handle concrete and were not useable for that purpose.*

Thus the Court, referring to the closest prior device says:

> "It would be practically useless for the purposes now involved."
>
> *Concrete Appliances* v. *Meinken*, 262 Fed. 958, 963.

And again

> "The question presented by Theiss seems not to be one merely of double use, because the structural differences are too great; but, if the physical resemblance were much closer, the defense of double use would be far from satisfactory. See Ansonia Co. *v.* Electrical Co., 144 U. S. 11, 18, 12 Sup. Ct. 601, 36 L. Ed. 327; Potts *v.* Creager, 155 U. S. 597, 606-608, 15 Sup. Ct. 194, 39 L. Ed. 275; Hobbs *v.* Beach, 180 U. S. 383, 390, 21 Sup. Ct. 409, 45 L. Ed. 586; Geld *v.* Newton (C. C. A. 2), 254 Fed. 824, 827, 166 C. C. A. 270. Certainly the art of loading coal into a ship for fuel is not the same art as that of distributing wet concrete to a building structure; nor is the analogy very close" (p. 964).

In the later decision of the Court of Appeals for the 3rd Circuit, the patent was held invalid *because the defendant in that case proved the use for concrete and similar materials of apparatus very similar to that of the patent.*

Thus the Court, after discussing the principal prior use *for concrete* and pointing out its similarity to that of the patent, said:

> "There is proof of the use at San Francisco Harbor in 1904-1906 of substantially similar *concrete chuting apparatus* placed on a scow. It clearly shows the use of chutes moved to different positions by a boom."
>
> *Concrete Appliances Co.* v. *Gomery*, 291 Fed. 486, 489.

And further, referring to the fact that the record in the 6th Circuit Court of Appeals did not show any prior *concrete* apparatus there in evidence said:

> "Had the actual state of the prior art been shown to the patent authorities, we cannot feel that they would have granted this patent, and while we feel embarrassed to find ourselves at variance with the Circuit Court of Appeals of the Sixth Circuit, which in the case of Concrete Appliances Co., *et al. v.* Meinken, *et al.*, 262 Fed. 958, found this patent valid, we feel assured that *the meager record* before that court wholly failed to disclose the now uncontradicted proofs on which we base our conclusions (*id.* p. 492)."

This Court held the patent invalid on the evidence before the Circuit Court of Appeals for the *Third* Circuit, saying:

> "Because of an evident *difference in the state of the proof* in the two cases, the adjudications of this patent by the two circuit courts are, we think, *only apparently conflicting.* It is clear from an examination of the two records, the earlier of which is an exhibit in this suit, as well as from the opinion of the court in the Sixth Circuit, that *that court did not have before it the detailed history of the practical development of the art*, which was elaborately proved in the present case and which convinced both the District Judge and the Circuit Court of

Appeals in the Third Circuit that the plaintiff's appliance did not embody an invention."

Concrete Appliances Co. v. *Gomery* (Nov. 16, 1925), 16 Sup. Ct. Rep. 42, 43; 17 L. Ed. (Adv. 40).

In the present cases the prior art disclosed is substantially the same in both records.

Neither record shows that any apparatus for transporting concrete or any similar material pneumatically was ever used. Neither record shows any apparatus for transporting *any* material by a packing or forcing pressure applied behind a mass of it and a nozzle pressure injected into the front of it.

The present case involves a radically different state of facts.

The apparatus of the Callahan patent involved in those suits consisted essentially of a tower in which the concrete was hoisted to any desired elevation, and movable swinging chutes or conduits through which the concrete was permitted *to gravitate* to various points on the building; *and obviously the gravitation of coal or grain or the like is not essentially different from that of wet concrete.*

The apparatus of the patent here in suit is one for elevating, conveying and placing concrete pneumatically, and the action of the apparatus of the prior art on concrete would be *entirely different* from their action on grain, sand, coal screenings and other light or easily disintegrated material. In fact, as has been abundantly shown, such prior apparatus *would not work at all with concrete*, and apparently none of the prior patentees ever attempted to so use it. Furthermore, the fact that concrete must be handled *without disintegration*, would make the action of the prior devices, if they could be made to operate at all, fatal to the mixture.

It is true that in the *Concrete Appliances* case, in the Third Circuit and in this Court, it was held that adapting the prior devices—with their actual adaptation for concrete begun—for use with wet concrete did not involve invention, once the use of wet concrete came into vogue. But that is not true in the present case, because the prior devices *cannot be adapted* for use with concrete, either wet or dry.

Furthermore, the present apparatus is primarily intended to handle dry concrete, which had been extensively used for at least half a century, and in using it the present invention filled a long existing need.

The patent says that one of the important advantages of it is that "relatively stiff" concrete "containing little or no excess of water"—the ideal mixture—can be used (p. 3, line 42), so that the use of wet concrete *in no way suggested the employment of the invention.*

It is shown by the evidence here that it was the practice to line tunnels with concrete by hand, and that the operation was costly, unsatisfactory, and under some conditions *impossible* (Kirk. Ulen R. 52, 53, 56 and 57). Mr. Kirkland says that in some cases *it could not be done by hand at all* (Q68, Ulen R. 52) and where it could be done (*Id.* 53)—

> "Q70. What is the general character of tunnel lining placed by hand as you have observed it? A. It is not uniform. If it is carefully done, it is a very slow process of course, it is satisfactory. It is likely to be carelessly done and with inefficient men and the human factor enters there a great deal.
>
> "Q71. How about the expense? A. The cost of placing pneumatically is, in ordinary tunnels, not done under air pressure, *from one-half to one-third* of the cost of doing it by hand or by other machines."

and in work done under air pressure the saving is *greater* (Q3, R. 276).

We have here an invention which filled a long felt need—since the Smith patent in 1872 at least—supplanted all other means, and went into universal use.

(Tunnel lining with concrete was practiced at least "as far back as 1880."—*Concrete* v. *Storrie*, R. 110-111.)

The able and learned opinion of Judge SWAN for the Second Circuit Court of Appeals, in this case, very clearly distinguishes the Gomery decision, in the following language (R. 343, 27 Fed. [2nd] 668):

> "It is urged that, because of his [Judge BOURQUIN'S] decision and the case of Concrete Appliance Co. *v.* Gomery, 269 U. S. 177, 46 S. Ct. 42, 70 L. Ed. 222, as well as because of new matter introduced in this record, we should reconsider the validity of the patent.
>
> "The new matter is, of course, open to us and will be dealt with hereafter. The Supreme Court case, however, contains nothing, in our opinion, which casts doubt upon the correctness of the Ulen decision; in fact, it was before us when that decision was made. It holds, affirming the judgment of the Circuit Court of Appeals for the Third Circuit in 291 F. 486, that the Callahan patent, which covered an apparatus operating on the gravity principle for distributing 'wet' concrete, was invalid, because it merely made use of known methods and appliances for the convenient handling of this recently accepted building material. The appellants' argument runs that, since the Supreme Court emphasizes that old apparatus used for distributing water, grain, or coal was readily adaptable for handling concrete, so the prior art patents for blowing sand, grain, or grout, which in the *Ulen* case were held not to invalidate McMichael's patent, should now be deemed com-

plete anticipations of it. But the Gomery decision does not rest merely on the assumption that apparatus for coal and grain could have been used for wet concrete without inventive thought. Adaptations of old carriers to handle concrete were shown to have been frequently made for several years before the application for the patent there in suit. The idea was already of common knowledge and was being applied generally. Therefore Callahan's adaptation was not an invention.

"But that is a very different situation from the one before us in the *Ulen* case, where nobody before McMichael had ever used a pneumatic apparatus to transport concrete."

THE CHICAGO ALLEGED PRIOR USE.

The unaided recollection of two persons after a lapse of twenty-three years is insufficient to establish a prior use defense.

No drawing, sketch, description, memoranda, record or other tangible, visible, contemporaneous evidence has been produced, and the memory of the witnesses is shown to be faulty in various particulars. Their testimony is further substantially contradicted by five others.

Perhaps the leading case on this point is that of *De-Laski & Thropp Co.* v. *Fisk Rubber Co.*, 203 Fed. Rep. 986 (C. C. A. 1st). In this case the Court, referring to the rule requiring tangible evidence, said (p. 993):

> "In Emerson & Norris Co. *v.* Simpson Bros. Corporation, 202 Fed. 747, 750, this court had the issue of anticipation before it. In the opinion of the court, handed down January 30, 1913, Judge PUTNAM reviewed certain cases upon this subject, and said:
>
> " 'The result of all these cases is that, with reference to questions of the class which we have

> here, namely, the identity of structure as between what is patented and what is alleged to have anticipated it, something more than oral testimony, even of the highest character, is required where there has been a considerable lapse of time.'
>
> The cases reviewed were, Brooks *v.* Sacks, 81 Fed. 403, 407, 26 C. C. A. 456; Westinghouse Co. *v.* Stanley Co., 133 Fed. 167, 174, 68 C. C. A. 523; Maxwell Land Grant case, 121 U. S. 325, 381, 382, 7 Sup. Ct. 1015, 30 L. Ed. 949; Morgan *v.* Daniels, 153 U. S. 120, 14 Sup. Ct. 772, 38 L. Ed. 657; Greenwood *v.* Dover, 194 Fed. 91, 114 C. C. A. 169."

And again:

> "In the cases to which we have referred, attention has been called to the practical safeguards which are deemed necessary against the frequently mistaken memory of witnesses as to events long passed. These cases show repeated refusals to sustain the defense of anticipation, in the absence of such testimony as book entries, illustrations, purchases, bills, orders, patterns. This is the kind of evidence which Judge PUTNAM refers to as 'concrete, visible, contemporaneous.'"

Even where visible, tangible evidence is produced the prior use must be established with that degree of certainty as to time and character which precludes reasonable doubt.

> *Deering* v. *Winona Harvester Works,* 155 U. S. 286.

But the Trial Court, after hearing all the witnesses in open Court, found that no prior use was shown (Opinion, R. 327), and that finding of fact is conclusive.

> *Adams* v. *Gilliland,* 242 U. S. 350; 37 Sup. Ct. Rep. 169.

The Court of Appeals also affirmed this finding (R. 345).

(For a discussion of the prior use evidence see Appendix.)

For the foregoing reasons the decision of the Circuit Court of Appeals for the Second Circuit should be affirmed.

Respectfully submitted,

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APPENDIX.

DISCUSSION OF CHICAGO ALLEGED PRIOR USE.

The following is a brief summary of the evidence.

1. The alleged prior use was said to have occurred *twenty-three years back*, and no documentary or other visible evidence was produced to support the verbal statements of the witnesses or to aid their memory. Such a feat of memory as that claimed by the witnesses, who had seen many concrete machines during the intervening twenty-three years, *including the machines of the patent in suit*, appears to be well-nigh *impossible*. It is believed to be a case of memory *reconstructed* both as to dates and facts, under the influence of the present surroundings.

2. The use—whatever it was—was *a mere unsuccessful and abandoned experiment*. The evidence of this is as follows:

> (a) Jackson is alleged to have used the machine only twice, and neither witness saw him use it (the last machine only is said to have been used for concrete) except for a very short time (Artingstall, Q47, R. 41, Fanning R. 132-3), and they had nothing to do with its construction or its operation. *They were mere casual observers.*
>
> (b) Although at least *60 miles* of tunnels were lined *by hand and mostly after* the alleged use, and by slow, laborious and awkward methods (Fanning R. 131), the machine was never used in these tunnels after the first alleged attempt. The attempt of these witnesses to explain away this abandonment by saying that Jackson found the machine more costly than hand placing, merely shows that it was not what they say it was. McMichael's invention very quickly went into ex-

tensive use, is universally used for tunnels today, and saves one-third to one-half of the cost of the work when not done under pressure, and more under pressure.

(c) Jackson was a prolific inventor and patentee (Fanning, Qs166-8, R. 130), and had he even thought that he had produced something useful he surely would have patented it. Certainly when McMichael's machine came out in 1907 and proved so valuable, Jackson would have asserted his right to it, if he thought he had any claim to it at all.

(d) It is admitted that the machine, whatever it was, *was abandoned, "dropped"* until "1907 or 1908," which was after McMichael entered the field and filed his application (Jan. 1907) for the patent in suit (Artingstall, XQ346, R. 85).

A prior use to constitute anticipation, must be

"so far appreciated at the time, and adopted or followed, as to create a well-understood, if not an established, practice, capable at any time of being resorted to, and not something incidental, indefinite, fugitive, which is now hunted up and brought forward simply for the purpose of defeating the patent."

Ajax Metal Co. v. *Bradley Brass Co.*, 155 Fed. 409, 416;

(Cited in *Carson* v. *American Smelting & Refining Co.*, C. C. A. 9th, 11 Fed. (2d) 766, 770, with numerous other cases).

3. The witnesses were shown to be mistaken as to date, and finally admitted it.

Artingstall fixes his date positively as *the year before* his marriage, which was June 18, 1904, and gives circumstances connecting it therewith (Q47, R. 41), and Fanning connects it with a bridge job and an accident which

took him away from Jackson for several days (Qs212-3, R. 137). When confronted with the record evidence showing that the Tunnel Company did not take over the building at 177 East Monroe Street until 1904, they both admit that they were mistaken (R. 199). Had they been shown evidence establishing that the use could not have taken place *until three years later*, no doubt they would have been just as ready to change their testimony to that date. It is evident that they have *no clear recollection* as to the year when they saw this particular machine, as distinguished from many other machines seen by them prior to the completion of the tunnel in 1909, which was years after McMichael entered the field.

4. The witnesses testify that the machine was used for grouting (Fanning R. 132), but it is apparent that a machine for placing grout, a relatively thin, smooth liquid, with a bottom jet such as that described by them, *could not be used*, because it would break up the solid stream of grout into sections divided by air and prevent its use for stopping leaks and crevices (Ray R. 274, Q92). The machine was evidently a grouter like that of the Canniff patent No. 873,345, with a top air inlet only, and possibly with means for letting air into the bottom of the machine *prior* to the discharging operation for *mixing* the grout. Mr. Artingstall says the "concrete" was very wet and like cream (R. 56).

5. At least one of the witnesses, Artingstall, is shown to be undependable. Passing his statement explaining Slade's nonappearance, that Slade "is a very, very old man and very feeble" (R. 81), and its refutation by Slade himself on the stand, he says Slade told him the tunnel records did not go back to 1907 (R. 81), whereas Slade produced tunnel records of 1902 and 1904 (Exhibits 15 to 18, R. 160-162). Again, he said that he told McMichael

in 1911 how to make his machine work by putting a jet at the bottom (R. 55), and this is answered by the patent itself applied for in 1907, which Artingstall evidently had not examined, the published descriptions of McMichael's work and apparatus in 1909, and his 1910 application showing exactly the 1911 machine with bottom inlet. (See Exhibits 12, 13, 14, R. 142-145.)

Artingstall's testimony on the stand differs in various essential particulars from his affidavit made in June, 1926 (Q66, R. 43; R. 71-3, 85, 101). In his affidavit he places the size of the gravel used as up to three-fourths inch diameter, and on the stand says it was up to one and one-half inches (R. 71-3). If it could increase to double its diameter in four months it could increase easily from thin grout to concrete with large aggregates in twenty-three years. He also repeatedly gives the place of use—right in the heart of the Chicago business section—as *Adams* Street (R. 41, 42 and 45), whereas it was *Monroe* Street (R. 55, Q120). This can only be attributed to very faulty memory.

6. Neither of the prior use witnesses had anything to do with the alleged use of the machine except to observe it on one or two occasions, and no reason to study or remember it. In such circumstances their unrefreshed recollection after all these years giving the details of construction and operation cannot be credited. Furthermore, Artingstall's sketch shows a large discharge pipe extending back of the outlet, whereas Fanning cuts its off near the outlet. This is an important detail, and would have to be conclusively established.

7. The reasons of the witness for the alleged use of the machine at 177 East Monroe Street *conflict*, Artingstall explains it by saying that Jackson was a peculiar man and Fanning by saying that he had no mixer there and therefore used this machine to mix. But Artingstall later says

that the materials were mixed for the machine with a shovel (R. 199).

8. Fanning's testimony as to the use in the tunnel is *entirely uncorroborated* and is shown to be impossible. He says that there were air pipes running through the shield or bulkhead carrying the compressed air for pneumatic tools (R. 124, 129, 135-6), and even makes a sketch showing them (Exhibit 11), but the four witnesses who had to do with the construction of the tunnel (this was the part fed by shaft No. 1), Ericson, Slade, Martin and Lynch—while Fanning's place of business was four miles away (R. 126)—state positively that there was no such air supply in the tunnel at any time up to 1907.

9. Mr. Artingstall admits that he received $100 per day and expenses for his services as a witness (Qs 3-7, R. 98), whereas his salary in Chicago is $5,000 per year (R. 147), which is less than $20 per day.

10. Finally, Fanning says that he last saw the machine at Jackson's disposal station excavation (Q95, R. 123), and Martin, who used Jackson's machine there—this was in 1907—states positively that it *was a grouter with top inlet only* (R. 188-9); and in this he is corroborated by Mr. Slade (R. 165).

A summary of the testimony of the rebuttal witnesses only is considered necessary. They are:

John Ericson, City Engineer, under whose general supervision the tunnels were constructed (R. 146).

Alfred Slade, engineer with Jackson on the construction of the tunnel and later chief engineer (R. 156).

John Lynch, City Inspector on the tunnel during the period 1900 to 1907 (R. 178).

Alfred J. Martin, the man who supplied all the concrete for the tunnel lining (R. 188).

Ernest A. Clark, Jackson's chief draftsman and engineer, who had knowledge of all machines made by Jackson at his shops (R. 192).

The witnesses Slade, Martin and Lynch were employed *in the tunnel daily* during the period mentioned, and Ericson inspected it frequently and had the reports on it from his inspectors and engineers.

Collectively their testimony establishes the following facts, among others:

1. That no pneumatic machine was used in the tunnel for placing concrete, or even for placing grout, prior to 1907.

2. That no such machine could have been used because there was no compressed air supply to operate it. The tunnels were dug in clay, which rendered boring and drilling machinery unnecessary. The work was all done by hand.

3. That all the tunnel lining was placed by hand, including the keys of the arches which were laboriously placed and rammed.

4. That if any one had used such a machine in the tunnel during that period they would certainly have known of it.

5. That no such machine was used at 177 East Monroe Street (Slade, R. 159-61) or even located there; that the floor of the basement was not done until the middle of 1904, and was not done by any machine (*id.*, 160-161); and that had such a thing occurred it would certainly have been known.

6. Mr. Clark further shows that after Jackson moved *in 1906* he did start to make a *grouting* machine; that one was made from his sketches and Clark's drawings with a flat bottom, and did not work (R. 192-5); and that sub-

sequently Jackson obtained another machine. It must be apparent that if Jackson had any operative machine—even a grouter—prior to 1907, he would have known how to make one at that time.

The testimony of these witnesses establishes that no such machine as that described by Artingstall and Fanning could have been used by Jackson or any one else prior to 1907, and until after the application for the patent in suit, in January of that year.

Here again we refer to the rule that the finding of the Trial Court, after hearing the witnesses and judging their credibility, that the evidence in support of the alleged prior use is insufficient or has been rebutted is unassailable. In the present case the Trial Court, after hearing the prior use evidence, found that:

> "No contemporary sketches are produced and the two witnesses attempt to describe from memory a mechanism which was not used except on two occasions. If such a practical device as that of the patent in suit had been employed, it is hardly likely that a contractor used to conducting large enterprises would not have sought a patent, or at least have taken advantage of something which in recent years has met with signal success. I am not satisfied that the defendants have established the prior use" (Op. R. 327).

In *Adams* v. *Gilliland*, 242 U. S. 350, 37 Sup. Ct. Rep. 169, 61 L. Ed. 356, this Court passed upon a situation very similar to the present one and said:

> "Considering that a patent has been granted to the plaintiff, the case is pre-eminently one for the application of the practical rule that so far as the finding of the master or judge who saw the witnesses *'depends upon conflicting testimony or upon the credibility of witnesses, or so far as there is any testimony consistent with the finding, it must*

> *be treated as unassailable.'* Davis *v.* Schwartz, 155 U. S. 631, 636, 39 L. Ed. 289, 291, 15 Sup. Ct. Rep. 237. The reasons for requiring the defendant to prove his case *beyond a reasonable doubt* are stated in the case of Barbed Wire Patent (Washburn & M. Mfg. Co. *v.* Beat Em All Barbed Wire Co.), 143 U. S. 275, 284, 36 L. Ed. 154, 158, 12 Sup. Ct. Rep. 443, 450."

If patents could be destroyed by such evidence as the defendants' in this case no patent would have any value.

It is for this reason, among others, and because persons can always be found who will say that a valuable patented device was used before the patentee used it, and will swear—sometimes honestly—that it was, that the courts have established the rule above referred to requiring more than mere oral evidence, and requiring in substance that the prior use must be established *beyond reasonable doubt.*

Not only is it well settled that to invalidate an issued patent prior use must be proved "by evidence so cogent as to leave no reasonable doubt," but it is equally well settled that an abortive experiment given up after a test is not sufficient to anticipate a patent. Perhaps the leading authority is *Deering* v. *Winona Harvester Works,* 155 U. S. 286, in which the Court said (p. 300):

> "As we have had occasion before to observe, oral testimony, unsupported by patents or exhibits, tending to show prior use of a device reguarly patented, is, in the nature of the case, open to grave suspicion. *The Barbed Wire Patent,* 143 U. S. 275. Granting the witnesses to be of the highest character, and never so conscientious in their desire to tell only the truth, the possibility of their being mistaken as to the exact device used, which, though bearing a general resemblance to the one patented,

may differ from it in the very particular which makes it patentable, are such as to render oral testimony peculiarly untrustworthy; particularly so if the testimony be taken after the lapse of years from the time the alleged anticipating device was used. If there be added to this a personal bias, or an incentive to color the testimony in the interest of the party calling the witness, to say nothing of downright perjury, its value is, of course, still more seriously impaired. This case is an apt illustration of the wisdom of the rule requiring such anticipations to be proven by evidence so cogent as to leave no reasonable doubt in the mind of the court, that the transaction occurred substantially as stated. The very exhibit produced by the witness Heller contradicted, so far as it could contradict, his testimony, and the witnesses who ought to have corroborated his story, gave a version which showed it to be untrue in more than one important particular.

"Under the circumstances, it would be going too far to reject his entire testimony, but giving it all the weight to which it can reasonably be entitled, it shows no more than that he affixed some sort of an extension to a butt-adjuster connected with an Appleby machine. If, as he says, in 1878, he tried a rigid extension and found it unserviceable, and subsequently, in the same season, he invented a pivoted extension, and it worked well, it is improbable that he would have cast it aside altogether at the end of the season, and taken up again the theory of a rigid extension, and applied it not only to his own, but to a number of other machines. His excuse that the binder was incapable of doing satisfactory work during the season of 1879, by reason of the shortness of the grain that season, is evidence that it was inoperative. If it had been a success, he would hardly have thrown it aside permanently. Doubtless he did use a rigid extension of some sort; but if he ever used a pivoted device at all—of which we have considerable doubt—his efforts in that di-

> rection must be relegated to the class of unsuccessful and abandoned experiments, which, as we have repeatedly held, do not affect the validity of a subsequent patent. *Corn Planter Patent*, 23 Wall. 181, 211; *Coffin* v. *Ogden*, 18 Wall. 120, 124."

This holding as to burden of proof has been reiterated by the Supreme Court in more recent cases than *T. E. Symington Co.* v. *National Malleable Castings Co.*, 250 U. S. 383, 1921; *Eibel Process Co.* v. *Minnesota & Ontario Paper Co.*, 261 U. S. 45, 1922.

In the *Eibel* case, the latest pronouncement of the Supreme Court on the proof required to establish prior use, the Court said (p. 60):

> "It is true that some witnesses testify that they realized before Eibel's application that speeding up the stock to equal velocity with the wire would solve the difficulty and aid the speed. But there is not a single written record, letter or specification of prior date to Eibel's application that discloses any such discovery by anyone, or the use of the pitch of the wire to aid the speed of the machine. The oral evidence on this point falls far short of being enough to overcome the presumption of novelty from the granting of the patent. The temptation to remember in such cases and the ease with which honest witnesses can convince themselves after many years of having had a conception at the basis of a valuable patent, are well known in this branch of law, and have properly led to a rule that evidence to prove prior discovery must be clear and satisfactory."

The rule so frequently stated by this Court has been reiterated and applied by this Court as recently as February, 1925, in *International Cork* v. *New Process Co.*, 6 Fed. (2nd) 420.

This Court in *Greenwald Bros.* v. *La Vogue Petticoat Co.*, 226 Fed. 448, said through Judge LACOMBE (p. 453):

> "As to the defense of prior use which has been interposed, it is to be remarked that there are two features as to which the proof must be satisfactory;
>
> "(1) The identity of the alleged prior structure with that of the patent must be shown;
>
> "(2) And the date at which the alleged prior structure was made must also be disclosed."

A most interesting case is the decision of his Honor, Judge LEARNED HAND, rendered in 1920 in *Kalamazoo Loose Leaf Binder Co.* v. *Wilson Jones Loose Leaf Co.*, 286 Fed. 715, S. D. New York, 1920. The invention in issue in that case represented a very slight advance over the admitted prior art, not a radical departure involving a new mode of operation as in the case at bar. It was a change which it was very probable would have been made. Judge HAND, however, while he said (p. 718) that the testimony "really persuades the Judge who saw the witnesses" refused to accept it as sufficient to invalidate the patent in suit and said (p. 717):

> "It is very probable that this modification the defendant actually perfected in the summer 1914, and one of the issues in the case turns upon whether the proof is adequate for that purpose. Nevertheless, although I have really no doubt that this was in fact done, I think the proof scarcely comes up to the severe standard imposed in such cases. There is no documentary corroboration of it, and the testimony of the witnesses, though unimpeached, is not supported by any circumstances which put it beyond the inevitable infirmities of their recollection. The most recent declaration of the Supreme Court, in Symington *v.* Nat. Castings Co., 250 U. S. 383, 39 Sup. Ct. 542, 63 L. Ed. 1045, shows no disposition to relax the well-established canon, and I decline to consider the use as proved."

In *Brown* v. *Zaubits*, 105 Fed. 242, S. D. New York, 1900,

the circumstances as stated by Judge COXE were as follows:

> "The defendant has called eight witnesses to corroborate his statements. They were examined in 1898 and testified regarding matters which transpired from five to eleven years before. The general course of the examination was to place in their hands the infringing pyrometer and ask them to compare it with the pyrometers which they saw eight, nine or ten years previous."

Judge COXE then said:

> "It is not necessary to denounce these witnesses as perjurers. * * * The desire to aid a friend, the actual presence of the infringing pyrometer, and the assurance of the defendant that the prior pyrometers were like it in structure may have encouraged imagination to encroach upon the domain of fact but this is a condition frequently encountered in patent causes. The witnesses may honestly have thought that they saw the platinum strip in a pyrometer made by the defendant prior to 1892. They are in all probability mistaken, but at least, there is a doubt about it and this doubt destroys the force of the defense."

Among other cases are *H. Mueller Mfg. Co.* v. *Glauber* (C. C. A. 7th), 184 Fed. 609; *Ecaubert* v. *Appleton*, 67 Fed. 917, 920 (C. C. A. 2nd), and *Howe* v. *Underwood* (the sewing machine case), 1 Fisher 160, Fed. Cas. 6775.

THE METHOD CLAIMS ARE FOR A VALID METHOD OR PROCESS.

A process to be valid need not change the character of the thing acted upon. It is sufficient if it changes the shape or position of the thing, or effects any other useful purpose. The decision in *Cochran* v. *Deener* does not make any particular *kind* of change necessary.

In *Kennedy* v. *Beaver*, 232 Fed. 477 (not appealed), Judge LEARNED HAND said (p. 278):

> "In Cochran *v.* Deener, 94 U. S. 780, 24 L. Ed. 139, the Supreme Court said that an art was an act or series of acts performed upon a subject-matter which was transformed or reduced to a different state or thing. The last expression of the court is Expanded Metal Co. *v.* Bradford, 214 U. S. 366, 29 Sup. Ct. 652, 53 L. Ed. 1034, in which the court disclaims any intention, as in Cochran *v.* Deener, of confining a process patent to a change in chemical substance. Even if an 'art' requires that the old elements be transformed into some new thing, *a new thing may be created merely from mechanical readjustments or the new juxtaposition of parts.* In this case a floor results from the laying of tiles under pressure, and such a floor is a different thing from cork tiles and brads and underflooring. The method of creating such a floor from such elements is surely a patentable process."

In the present case the concrete mixture is discharged, conveyed and placed to form walls or other parts of tunnels, or other structures, and in such operation is preserved against separation and even more intimately mixed.

Neither the constitution nor the patent statute (Sec. 4886, U. S. R. S.) requires that a process, which in the language of the statute is an "art," shall produce any particular *kind* of result, so long as that result is new and useful.

Mr. Justice CURTIS, speaking of a process for the majority of the court in the case of *Winans* v. *Denmead*, 56 U. S. (15 How.) 329, 340 (14 L. Ed. 717), said:

> "Its substance is a new mode of operation, by means of which a new result is obtained. *It is this new mode of operation which gives it the character*

> *of an invention*, and entitles the inventor to a patent; and this new mode of operation is, in view of the patent law, the thing entitled to protection."

Mr. Justice BRADLEY said in the case of *Tilghman* v. *Proctor*, 102 U. S. 707, 728 (26 L. Ed. 279), quoting from the opinion of Chief Justice TANEY in the case of *O'Reilly* v. *Morse*, 56 U. S. (15 How.) 61, 62; 14 L. Ed. 601:

> "Whoever discovers that a certain useful result will be produced in any art by the use of certain means is entitled to a patent for it, provided he specifies the means. But everything turns on the force and meaning of the word 'means.' It is very certain that the means need not be a machine, or an apparatus; it may, as the court says, be a process. A machine is a thing. *A process is an act, or mode of acting.* The one is visible to the eye, an object of perpetual observation. The other is a conception of the mind, seen only by its effects when being executed or performed."

This question seems to be disposed of in the present case by the following considerations:

1. That other machines or mechanisms may be used to practice the method or process.

Thus, "introducing compressed air behind the mass of materials" may be done in various ways. The defendants' apparatus in the *Ulen* case shows a plunger or pusher advancing in the closed chamber, which compresses the air therein and introduces such compressed air behind the mass. If the compressed air inlet at the top, which introduces additional compressed air behind the mass, were omitted we would have a means for introducing air behind the mass not shown in the patent and not "a compressed air *inlet pipe*" as specified in some of the apparatus claims.

Thus also compressed air may be introduced "behind the portion thereof lying adjacent the conduit" by means of a piston near the outlet and in communication therewith, and this would not be "another compressed air inlet pipe leading through the chamber wall and terminating within the chamber near the opening into the conduit," as specified in Apparatus Claim 2, as the compressed air would originate within the chamber itself. Again the rapid intermittent action of the compressed air jet at the outlet might be brought about by a reciprocating piston controlled automatically, like the piston of a steam engine, or by hand.

Again, in the present case, the petitioners' compressed air behind the mass was introduced by the bottom air inlet and not by the top air inlet, after the top air was disconnected. This was another method of practicing the process or method, and was not covered by the claims drawn to the specific form of apparatus shown in the patent.

It is also conceivable that "closing the receptacle," as specified in Method Claim 4, might be brought about by other means than the door 5, as, for instance, by applying the end of a compressed air conduit to the opening 3 after the concrete is placed therein.

And various other changes in the mechanism might be made, which would make it quite different in construction and specific functions and yet adapt it to the full performance of the method. In fact, the entire machine could be reorganized and built along different lines.

2. The practice of the method or process must be brought about by human intelligence and by manipulation of the controls for the forces employed by the machine.

Thus, the door must be closed by manipulation of its chain or in some other manner. In the machine shown, the valve 9 must be opened to admit compressed air be-

hind the mass, and the valve 11 opened to admit compressed air behind the portion of the mass adjacent the conduit. The air compressor 7 must also be operated to create a supply of compressed air. All these operations must be performed by hand or by some other means *to put in operation and maintain the action of the process.*

The machine shown will not operate to practice the method unless it is properly controlled and manipulated. Thus variations in the exact nature of the concrete and in the conditions of the work will require variations in the control of the apparatus known to the skilled operator (see Bateman, Q53, Ulen R. 117).

For the foregoing reasons it is obvious that the method or process is not the mere function of the machine, but is "a mode of operation" in which the machine may be employed.

His Honor Judge AUGUSTUS N. HAND, in disposing of this question, said:

> "The process claims are limited to no particular form of apparatus so that the contention that they are for a mere function seems without merit. Expanded Metal *v.* Bradford, 214 U. S. 366; Buffalo Forge Co. *v.* City of Buffalo, 255 Fed. 83."

The distinction between a patentable method or process and the mere function of a machine is well brought out by these authorities.

In *Corning* v. *Burden* 15 How. 252; 14 L. Ed. 683, Mr. Justice GRIER, said:

> "But it is well settled that a man cannot have a patent for the function or *abstract effect* of a machine, but only for the machine which produces it."

And in *National Hollow B. B. Co.* v. *Interchangeable*

B. B. Co., 106 Fed. 693, 708, the claims were for "the turning of the nuts upon the ends of the tension rods or member of the beam," etc., and the Court said that this was "one of the products or functions of the air-brake beam," and that the "spring or resilience" of the beam could not be patented.

Referring to this case the Court of Appeals for the 8th Circuit in *Denning Wire & Fence Co.* v. *American Steel & Wire Co.*, 169 Fed. 793, 797, said:

> "There, the attempt was to monopolize the function or operation of a device *acting upon, or within, itself*, and not a device or machine designed to act upon something external to itself."

In that case the Court seeking a definition of the term "mere function of a machine" stated that one that would apply to all cases could hardly be formulated, and

> "But for the present purposes it may be said to be that power or property of the machine of acting in the specific manner designed or intended by its construction; in other words, that which the machine is designed to do, as distinguished from the machine itself, and from the product of its action upon something external to itself."

These and other authorities are to the effect that a patent may be had for the machine, but not for the mere operation or function of the machine. *They do not, however, deny the right to an inventor to patent a new and useful method or process of producing a certain result regardless of the particular character of the means employed in its production.*

As the Court of Appeals said in *Buffalo Forge Co.* v. *City of Buffalo*, 255 Fed. 83, 87:

> "If it is not reasonably possible to separate the alleged process from the disclosed means, the for-

mer can hardly be more than the function (or at least a function) of the latter. This is no more than applying the doctrine of Leeds *v.* Victor, etc., Co., 213 U. S. at page 318, 29 Sup. Ct. at page 500, 53 L. Ed. 805:

> "'A process and an apparatus by which it is performed are distinct things. They may be found in one patent; they may be made the subject of different patents.'
>
> "If such difference *cannot be discovered*, they cannot be two things; therefore they must be one thing, *i. e.*, one invention, and that one is usually the means.
>
> "*But that the means, and the only means of applying the process, are strictly mechanical, is a matter of no moment, so far as patentability is concerned.* If the process, when distinguished from the means of performing it, is new, useful and intellectually rises to the dignity of invention, it is patentable—if it falls within the meaning of the word 'art' as used in the statute."

Finally, this Court in *Expanded Metal Co.* v. *Bradford*, 214 U. S. 366; 53 L. Ed. 1034, holding valid the Golding patent for a method of cutting and stretching sheet metal, performed wholly by the automatic and mechanical operation of a machine, said:

> "This Court, speaking through Mr. Chief Justice WAITE, sustained a patent in the *Telephone* cases, 126 U. S. 1, 31 L. Ed. 863, 8 Sup. Ct. Rep. 778, for a method of transmitting electrical undulations similar in form to the vibrations of the air accompanying vocal sounds, and at the same time the patent for the apparatus by which the method was operated was sustained.
>
> "In Leeds &c. Co. *v.* Victor Talking Mach. Co., decided at this term, 213 U. S. 301, 318, *ante*, 495, 500, 29 Sup. Ct. Rep. 495, 500, this court said: 'A process and an apparatus by which it is performed

> are distinct things. *They may be found in one patent*; they may be made the subject of different patents.'
>
> "*We therefore reach the conclusion that an invention or discovery of a process or method involving mechanical operations, and producing a new and useful result, may be within the protection of the Federal statute, and entitle the inventor to a patent for his discovery.*
>
> "We are of the opinion that Golding's method was a substantial improvement of this character, independently of particular mechanisms for performing it, and the patent in suit is valid as exhibiting a process of a new and useful kind."

It is thus settled that if a new and useful process or method of operating or acting upon any material to produce a certain result is the subject of a patent, the patent is valid regardless of whether that result is produced by the automatic operation of a machine or in other manner.

This, we submit, has been the law from the beginning, although it seems at times to have been obscured to some extent by decisions in particular cases in which no method or process was invented, but merely a machine, and an attempt made to patent the machine as a process by claiming its mere function or way of operating. This is shown by the decision in the *Telephone* cases (126 U. S. 1) referred to in the *Expanded Metal* case (*supra*), in which the Supreme Court sustained the following claim of the Bell patent:

> "The method of, and apparatus for, transmitting vocal or other sounds telegraphically, as herein described, by causing electrical undulations, similar in form to the vibrations of the air accompanying the said vocal or other sounds, substantially as set forth."

It will be seen that the method set forth in Bell's claim

is similar to the method claims in the present case, though of much broader and more general scope; that it was carried out by the automatic operation of certain apparatus; and that it did not change the character of any physical thing.

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(End of Appendix.)